# Valve Spring Tester V1.1B for Windows

# User's Manual


## Performance Trends, Inc.

Box 530164 Livonia, MI 48152
248-473-9230  Fax 248-442-7750
Website:  www.performancetrends.com
Email:  feedback@performancetrends.com

Performance Trends, Inc.  PO Box 530164, Livonia, MI 48152
Tech Assistance for Registered Owners (248) 473-9230  Fax: 248-442-7750  Email:  feedback@performancetrends.com

Website (tips, correspond with other users, download demos, update schedule, etc.)  www.performancetrends.com



Continued on next page.

IN THE EVENT ANY REMEDY HEREUNDER FAILS Of ITS ESSENTIAL PURPOSE, OR IN ANY OTHER EVENT, PERFORMANCE TRENDS INC.'S LIABILITY HEREUNDER SHALL NOT EXCEED ANY AMOUNTS PAID BY USER TO PERFORMANCE TRENDS, INC. UNDER THIS AGREEMENT.

Some states do not allow the limitation or exclusion of liability for incidental or consequential damages and some states do not allow the exclusion of implied warranties, so the above limitations or exclusions may not apply to you.

No action, regardless of form, arising out of any claimed breach of this agreement or performance under this agreement may be brought by either party more than one year after the affected party learns of the cause of action.

Refer to diskette envelope for full license agreement.

********** W A R N I N G **********

The Valve Spring Tester makes calculations based on equations and data found in various published and heretofore reliable documents. The program is designed for use by skilled professionals experienced with engines and Tests. The following processes are hazardous, particularly if done by an unskilled or inexperienced user:

- Obtaining data to input to the program
- Interpreting the program's results

Before making measurements of or modifications to any Test, engine or driving situation, DO NOT FAIL TO:

- Regard the safety consequences
- Consult with a skilled and cautious professional
- Read the entire user's manual
- Obey all federal, state & local laws
- Respect the rights and safety of others

Table of Contents

# Chapter 1 Introduction

## 1.1 Overview of Features

The Valve Spring Tester v1.1 program by Performance Trends, Inc is hardware, electronics and software to help engine builders "streamline" their valve spring testing. Various combinations are available with as little as just the software, software and electronics “retro-fit” kits for existing spring testers like Power Tech ™ or Rimac ™, up to the complete package of software, electronics and test stand. The program offers options to record, calculate, save, graph, organize, retrieve, report and analyze spring height and force test data. The Valve Spring Tester v1.1 is a unique program which will save test time and improve the analysis of spring test data.

### Features:

- Capability to tailor the program to work with Performance Trends’ spring tester stand or most any other spring tester.
- User friendly, Windows interface, compatible with Windows 95, 98, Me, XP, 2000 and NT.
- Can print results using most any Windows compatible printer, many times in color.
- Save nearly unlimited number of tests for recall, comparison and analysis in the future.
- Allows several reporting and graphing options for analysis.
- Allows you to analyze data either at various spring heights, or at various amounts of spring compression.
- Allows for either:
  - Detailed and formatted Complete Tests, typically for a set of springs for the complete engine
  - “Quick Check” tests where you just need a quick check of one of several springs and are not interested in keeping a permanent record, other than printing the results.
- With a complete test, you can also:
  - Record data for up to 48 springs.
  - Allow for specs for the intake and exhaust springs to be the same or different.
  - Record additional info like comments, customer name, etc.
  - Make checks to flag out springs which do not fall within up to 3 user defined limits, like Spring Non-Linearity greater than 5% and Spring Rate less than 250 lb/in.
- Customize printed reports and graphs. You can include comments for each spring graphed.
- Write ASCII files for importing data into other computer programs.
- Filter (find) past tests based on certain criteria, like Force at Seated or Open Heights, certain Customer name, etc like a data base program.
- "History Log", keeps a running log of tests you have recently started new, run, graphed or reported.

Please read Sections 1.2 "Before You Start" and 1.3 "A Word of Caution" before you turn on the computer. Then install the program following the guidelines in 1.4 "Getting Started" and try running it following section 1.5 "Example to Get You Going". When you feel a little familiar with the program, take time to read this entire manual. It will show you all the things you can do with this powerful tool.

**IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

# 1.2 Before You Start

What you will need:

- Most any Windows computer
- Approximately 20 Megabyte of disk space. (More is required for storing large #s of tests.)
- Windows XP, Vista, Win 7, Win 8, Win 10.

Many terms used by the Valve Spring Tester and this user's manual are similar to terms used by other publications, i.e. Non-Linearity, Spring Rate, etc. However, these terms may have different definitions. Therefore, read Chapter 2 to see what these terms mean to the Valve Spring Tester.

Occasionally it will be necessary to identify "typos" in the manual, known "bugs" and their "fixes", etc. which were not known at the time of publication. These will be identified in a file called README.DOC in the Valve Spring Tester directory or "V-Spring" folder. To read this file, click on Help at top of Main Screen and then click on Display Readme.doc file.

## Unlocking Program:

The Valve Spring Tester has some minor copy protection. This ensures the legitimate users do not have to cover the costs for unauthorized distribution of the program. See Section 1.4 on unlocking the program.

# 1.3 A Word of Caution

First, before switching from your current method of recording Spring Data (either hand recording or via some other type of electronics) to the Performance Trends Valve Spring Tester, you should be very familiar with the Valve Spring Tester v1.1 program and your computer in general. See the precautions in Section 2.0 and Example 4.1.

**The spring testing requires you to compress a valve spring, storing energy in its coils. Should something cause the spring to slip out of the spring tester, the spring could easily injure the user. Be sure to observe all safety warnings and use proper safety equipment like guards and safety goggles.**

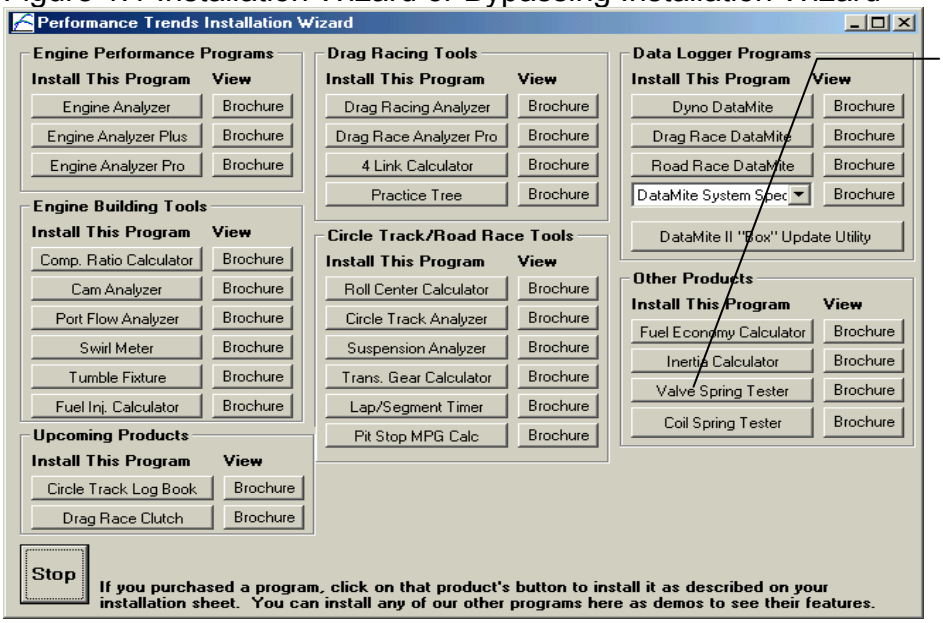
Please also read the Warranty and Warning at the beginning of this manual and on the diskette envelope.

# 1.4 Getting Started (Installation)

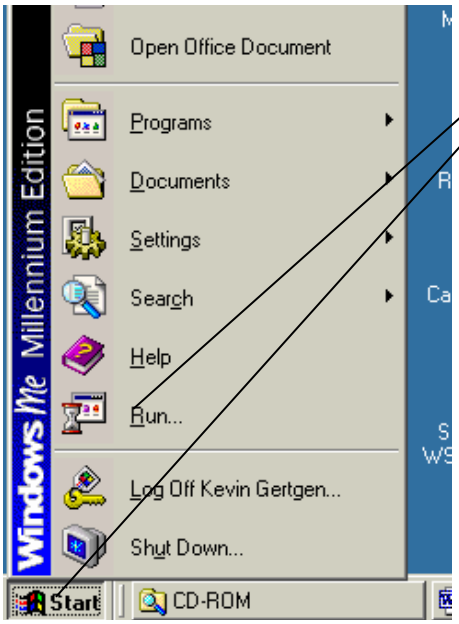
You must install the Valve Spring Tester from the distribution CD to a hard drive before it will run. To do this, simply install the CD in your CDRom drive and the Performance Trends Installation Wizard should automatically start, allowing you to install the Valve Spring Tester and demos of any of our other products.

If the CD does not auto-run, then click on Start, then Run, then Browse and find your CD drive. Then look for SETUP.EXE on the CD and run it to run the Installation Wizard. If you want to bypass the Wizard, go into the Programs folder on the CD and run the **VSpring.exe** file.

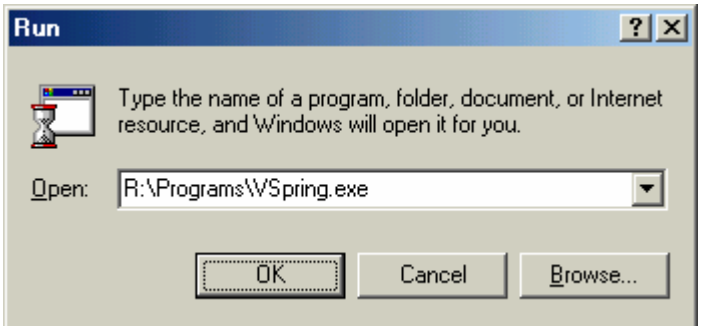
Figure 1.1 Installation Wizard or Bypassing Installation Wizard




The Installation Wizard will Auto-Start when you insert the program CD. Here's the Valve Spring Tester button to install this program. You can also install any or all of the other demo programs on the CD. Click on the Brochure button by a particular product for a description with illustrations (a brochure) of that program to be displayed.




To bypass the Installation Wizard, click on Start, then Run, then Browse from the Run screen shown below to find the CDRom, then the Programs folder on the CD, then the VSpring.exe file in the Programs folder.



## Entering Registered Owner's Name:

The first time you run the Valve Spring Tester, you will be asked to enter your name as the Registered Owner. During this first session, you can modify it until you are satisfied. Once you accept the name, the computer will generate a Registered Code # based on the name. (If you purchased the program directly from Performance Trends, you probably were sent a suggested Reg Name as described in the "Unlocking Program" section below.) To be eligible for Tech Help, you will need both your registered name and code #. The name you enter should be very similar to the name under which you purchased the program.

Click on "Reg To:" at the top of the Main Screen to review your name and code #.

## Unlocking Program:

The Valve Spring Tester has some minor copy protection. This ensures the legitimate users do not have to cover the costs for unauthorized distribution of the program.

When you first receive the program, it is in demo mode. ***All features work in Demo mode except the ability to read a spring tester or import Power Tech ™ files.*** This demo mode is useful as a Valve Spring Tester file "viewer". Should your customers want to make reports or graphs of results you have created, they can just obtain a demo copy (from CD or website) and use it to do their own analysis of files you have created. They can do everything you can do except measure springs through the tester (or Import Power Tech ™ files).

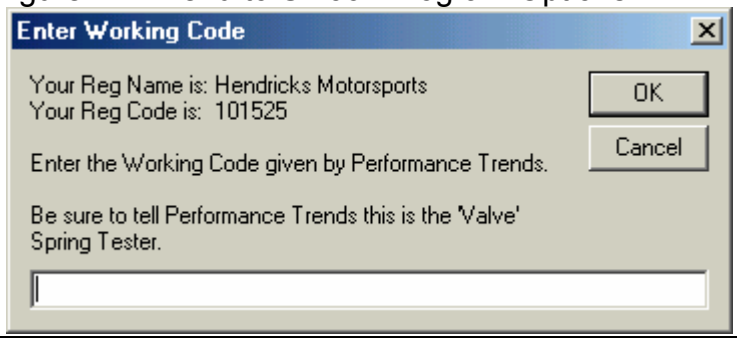
If you purchased the program directly from Performance Trends, you probably were sent a suggested Reg Name and the resulting Reg Code # you should get from that Reg Name. The Reg Name is case sensitive, which means it matters which letters you capitalize. You would have also been sent the unlock code that will unlock the program for that name.

If you purchased from the internet, or are having problems unlocking your program, you can call Performance Trends you're your unlock code. Before you call Performance Trends, you should get your Registered Name and Registered Code number. These are available by clicking on File in the upper left hand corner of the Main Screen, then clicking on Unlocking Program. A screen will appear as shown in Figure 1.2.

Performance Trends will provide you an unlocking code number. Type in the unlocking code number and click on OK. If you typed in the number correctly, you will be given a message that the program is permanently unlocked.

If you want to run the program on another computer, you must use the same Registered Name (it is case sensitive, which means it matters which letters you capitalize) and it will then generate the same Registered Code. Then the same Unlocking Code will unlock it.

Figure 1.2 Menu to Unlock Program Options



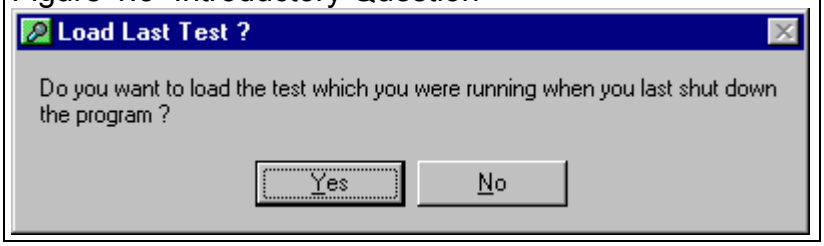

**IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

# 1.5 Example to Get You Going

To start the Valve Spring Tester, click on the Valve Spring Tester desktop icon. (An alternate method is to click on Start, then Programs, then Performance Trends, and then Valve Spring Tester.) During startup of the program, you will be given some introductory tips.

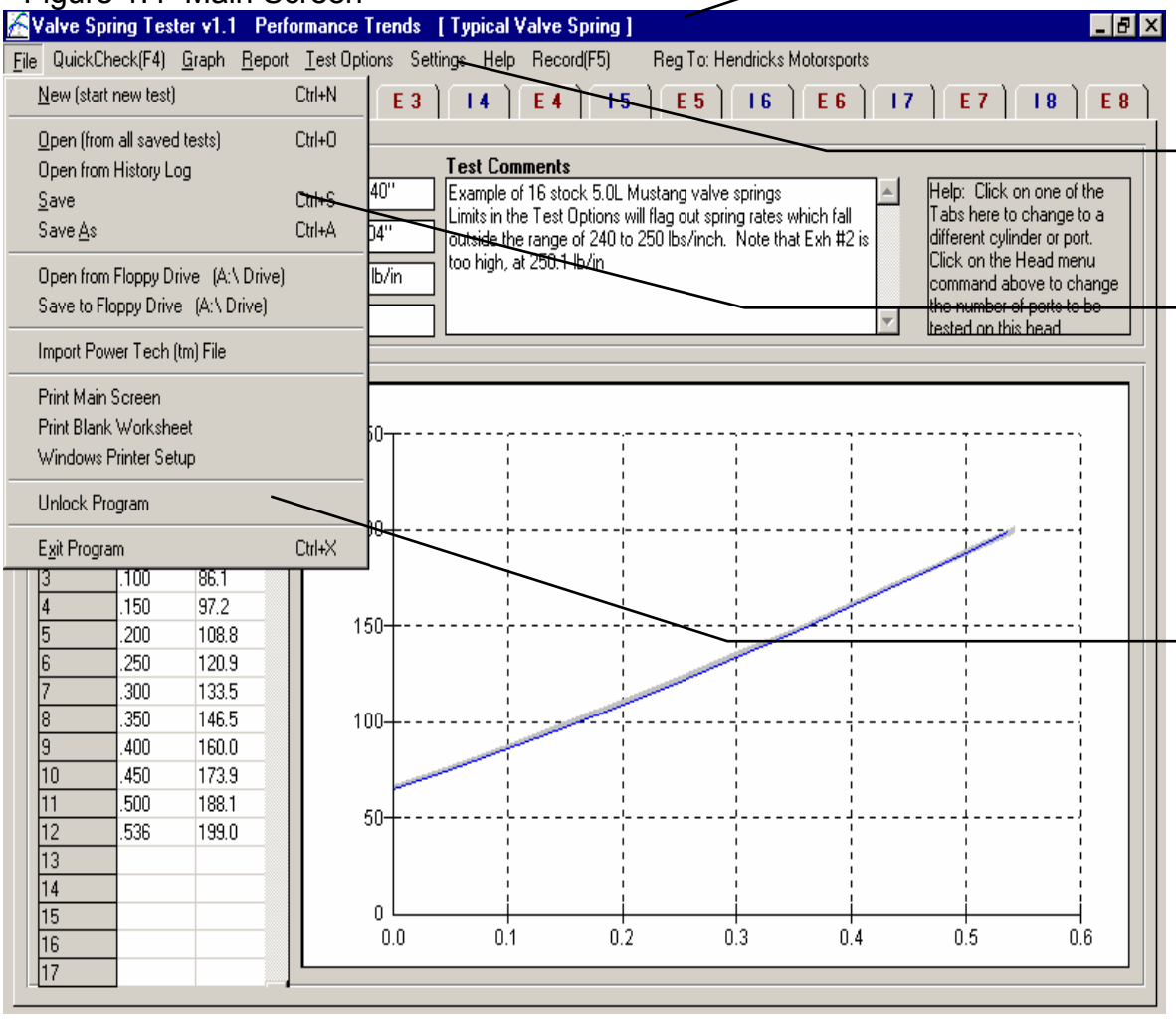
One of these "Tips" will ask if the "last test you were running should be loaded". If you have just received the program, this test will be an example test which was loaded at the factory. If you have run the Valve Spring Tester before, this will be the last test you were working with. If you are just learning the program, it is recommended you answer yes to this question so you have some example data to work with to understand how the program works.

Figure 1.3 Introductory Question




After these brief introduction screens and questions, you will be left at the Main Screen shown below:

Figure 1.4 Main Screen




Name of current test you are working with

Menu Commands

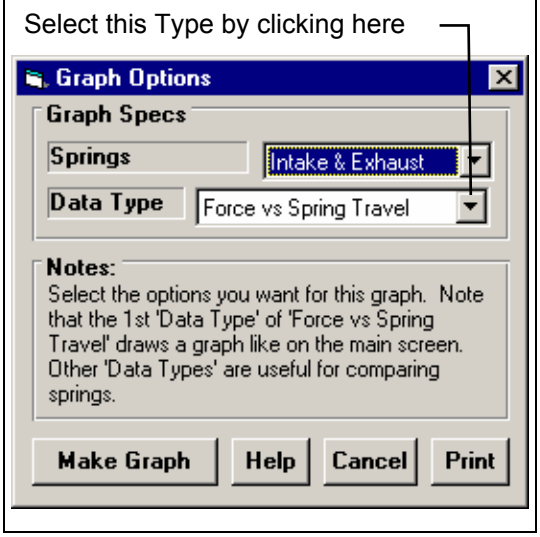
Click on File, then choose from different Save or Open options

Click on File, then Unlock Program to allow the program to record data from the spring tester. See Section 1.4.

From this Main Screen, you can:

- Choose to review your options by clicking on the menu items at the top of the screen.
- Open or save a file of test results and specs by clicking on File in the upper left corner, and then the Open or Save commands.
- Add, edit or review test comments for the file you are currently working with.
- Run a "Quick Check" on one or more springs, which will not disrupt the main test data on the main screen.
- Graph or report the test for the file you are currently working with.
- Select if you want to analyze results at either various amounts of spring height, or spring compression from Seated Height (more like the spring will be used in the engine).
- Change the Preferences options to somewhat customize the program for your needs.
- Get HELP to explain these options by clicking on Help.
- Quit the program by clicking on File, then Exit.

Figure 1.5 Graph Options Menu

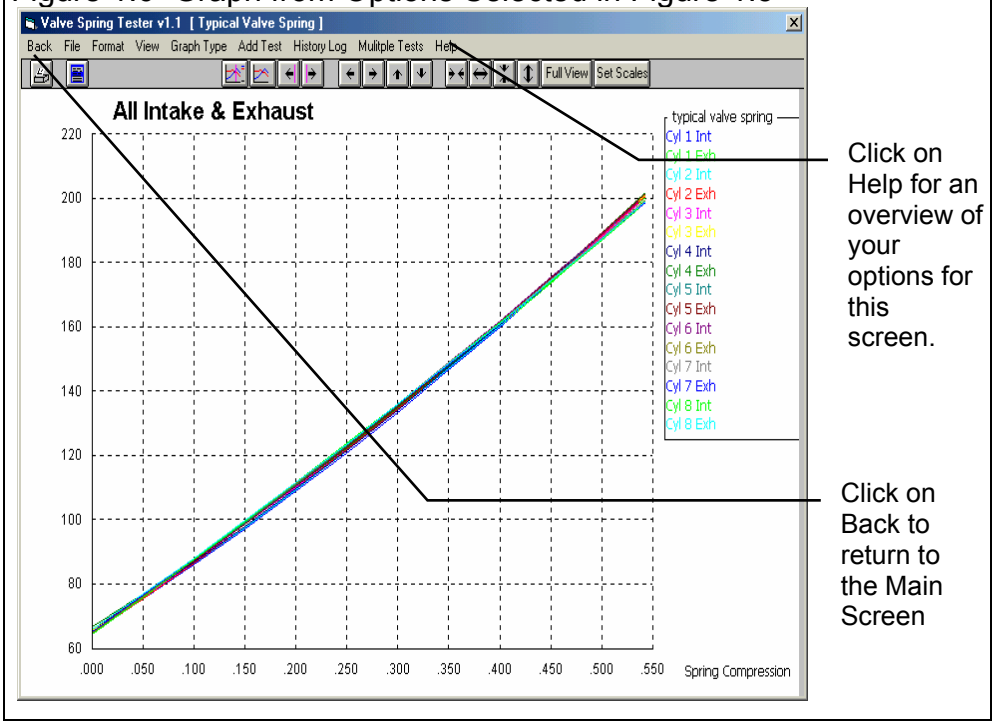



All these options are explained in detail in Chapters 2 and 3.

In the Main Screen's blue title bar you will notice the name of the current test is contained in square brackets [ ] (if you did load in an old Spring Test at program startup or opened a file by clicking on File, then Open). The program has some examples of tests saved in the Test Libraries' Example folder right from the factory.

To get started, let's try a couple of Menu commands. Click on the Graph menu command to open up the graph options menu shown in Figure 1.5. That Graph Type shown in Figure 1.5 is for Intake and Exhaust Force vs Spring Compression. If this is not the graph type you see on your computer screen, click on the down arrow to select Intake and Exhaust for the "Springs" and Force vs Spring Travel for the "Data".

Figure 1.6 Graph from Options Selected in Figure 1.5

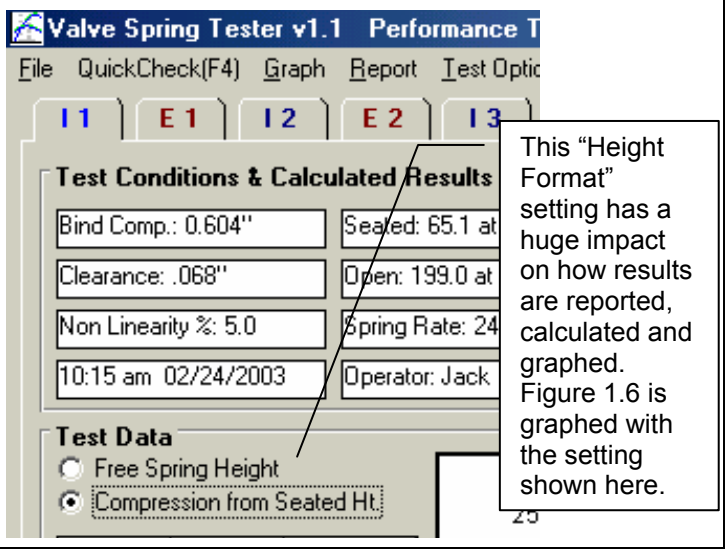



Click on the Make Graph button to produce the graph shown in Figure 1.6. At the graph screen you have several other options available for changing the graph. These options are available by clicking on the commands in the menu bar or on the buttons at the top of the screen, including the Help command. The Help command at this screen (and most screens) provides a good background on what the various options are. For now, just click on Back at the upper left to return to the Main Screen.

If you do not see "Spring Compression" as shown in the lower right corner, then you are have the Spring Height Format set to analyzer all data at "Free Spring Height" and not "Compression from Seated Height". See Figure 1.7.

A Test File is made up of the Spring Data (force at various spring lengths) and other data like Seated Height, Retainer Thickness, etc. This is explained in Section 3.6 "Data Libraries". Click on the Test Options command to obtain a menu as shown in Figure 1.7.

Figure 1.7 Setting Spring Height Format

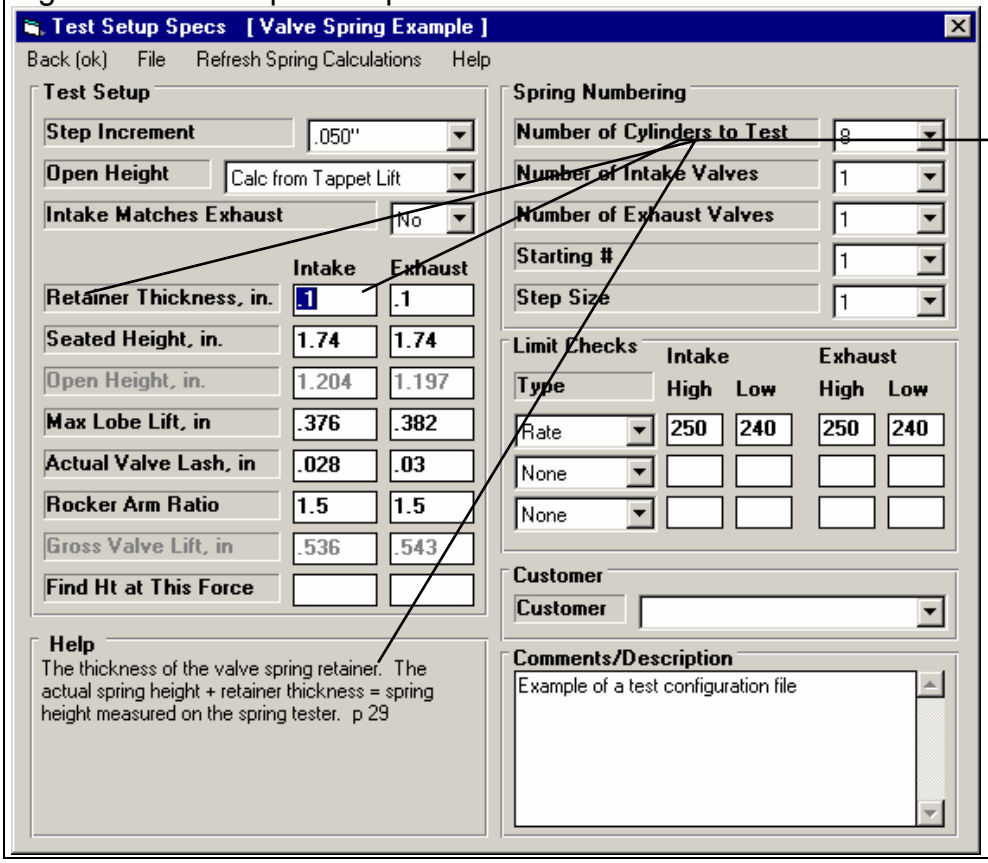



These specs are used for calculating certain outputs (like Seated Force, Open Force, etc), and they are useful descriptions to remind you of what this head was in the future.

Many of the input specifications you see in the various menus may not be familiar to you. For a brief definition of the inputs, simply click on the specification name. The definition will appear in the Help frame with a page # in this manual for more info.

Once you feel comfortable changing specifications in the various menus and making various performance calculations, read Section 3.6 of this manual called Data Libraries to learn how to save a set of data or component specifications or recall information which has been previously saved. Then you will know all the basic commands to operate the program. For a more in-depth knowledge of using these commands and an explanation of the results, read this entire manual.

Figure 1.8 Test Options Specs Menu



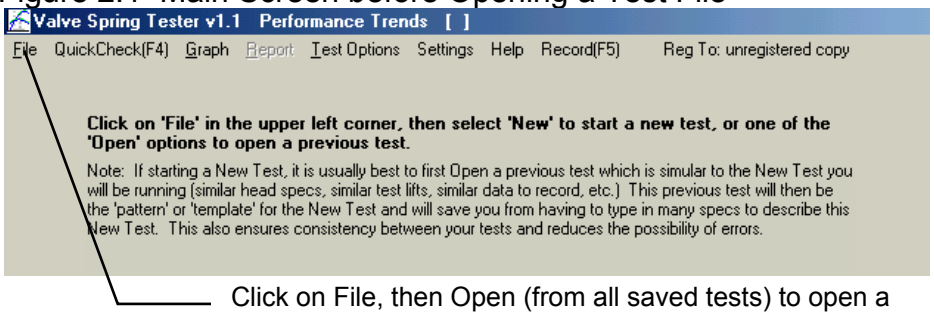
# Chapter 2 Definitions

## 2.0 Basic Program Operation:

Whenever you start the Valve Spring Tester, you are brought to a Main Screen which will look like either Figure 2.1 or 2.3. If you have not yet selected a test to work with and have not started a new test, the Main Screen is mostly blank, like Figure 2.1.

If you want to Open a previously saved test, you can click on File in the upper left corner, then click on Open (from all saved tests). You will get a screen as shown in Figure 2.2 where you are presented with a list of saved tests in the Test Library. Some tests are examples provided by Performance Trends. As you run tests yourself and save the results, you will add many more tests to the library. These saved files are useful for making comparisons in the future, and can be used as test patterns (or templates) for new tests (saving you considerable time by not having to type in specs which match a past test).

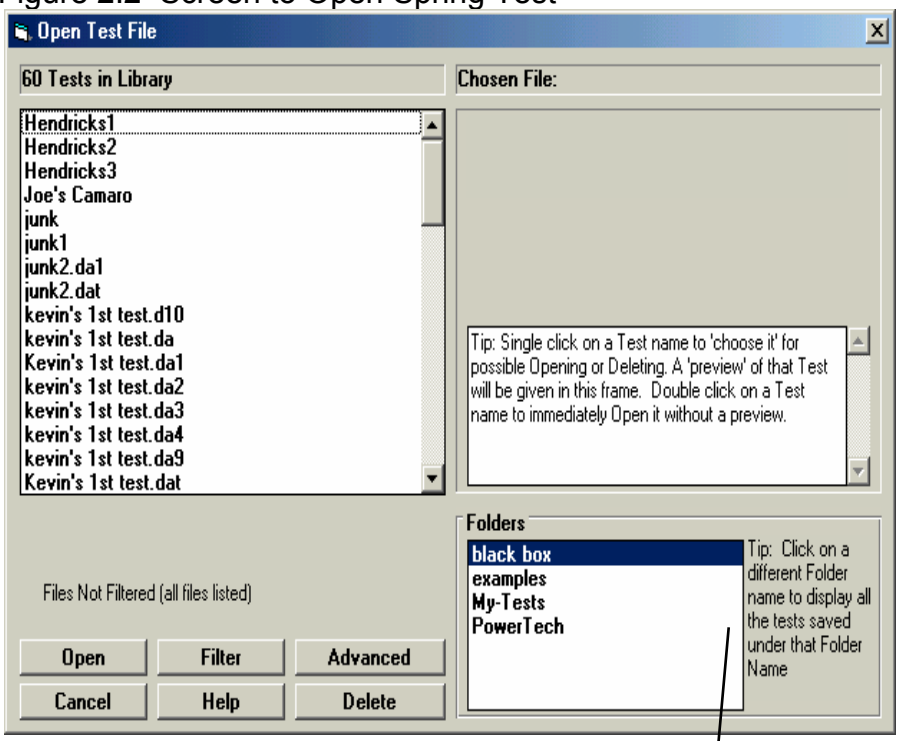
Figure 2.1 Main Screen before Opening a Test File




Click on File, then Open (from all saved tests) to open a previously saved test file. You can also open an Example Test file provided with the program. You will obtain a screen as shown in Figure 2.2.

Figure 2.2 shows that the Test Library is divided into sections (called Folders in Figure 2.2) to help organize a large number of tests. For example, all spring tests for the company ABC Engines could be saved under a section name of "ABC-Engines". All 4 cylinder Ford tests could be saved under a section name of "4 Cylinder Fords". This will save considerable time and confusion when trying to locate a particular test in the future. To look in different sections, click on the Folder name from the list shown at the lower right of Figure 2.2. The list of tests will then be updated for that Folder. To pick a test, simply click on it from the list of tests, then click on the Open button. (For those familiar with computers, Folders are the folders in the SpringData folder. The Name "Folder" can be changed to something else, like "Customer" or "Engine Family".)

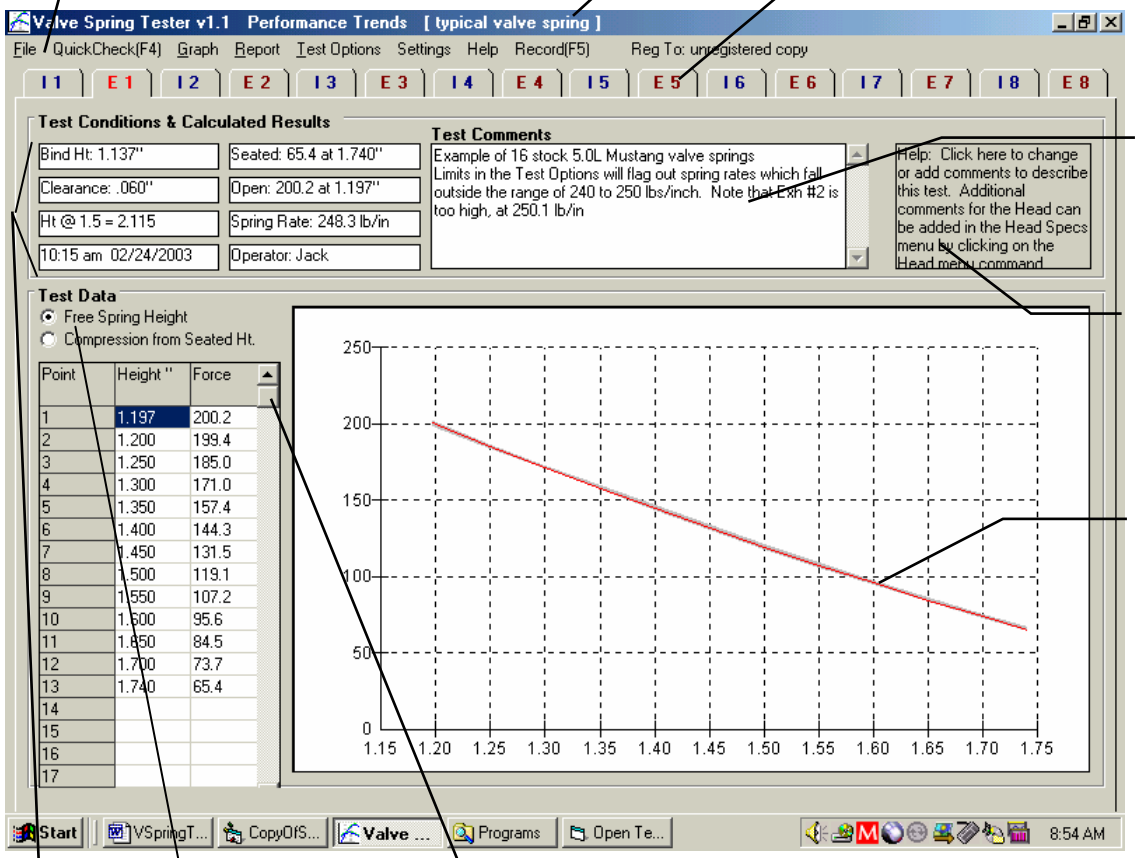
Figure 2.2 Screen to Open Spring Test




Click here to pick a different category or group of tests (Folder) from which to display a list of Test Files.

If you ***are*** working with particular test, the data will be presented as shown in Figure 2.3. Notice in Figure 2.3 that a

Figure 2.3 Main Screen After Opening a Test File




current test name is listed at the top in square brackets [ ]. This is the file of spring specs, Spring Data, etc which are currently saved in the Spring Data Library, and are the data and specs you are currently working with. If you change the Spring Data or specs, make a graph or report, it is for this test file.

If you click on one of the Menu Commands at the top of the Main Screen, you can be presented with screen of specs, as shown in Figure 2.4. Figure 2.4 discusses some of the commands to enter or change settings at this menu.

**IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

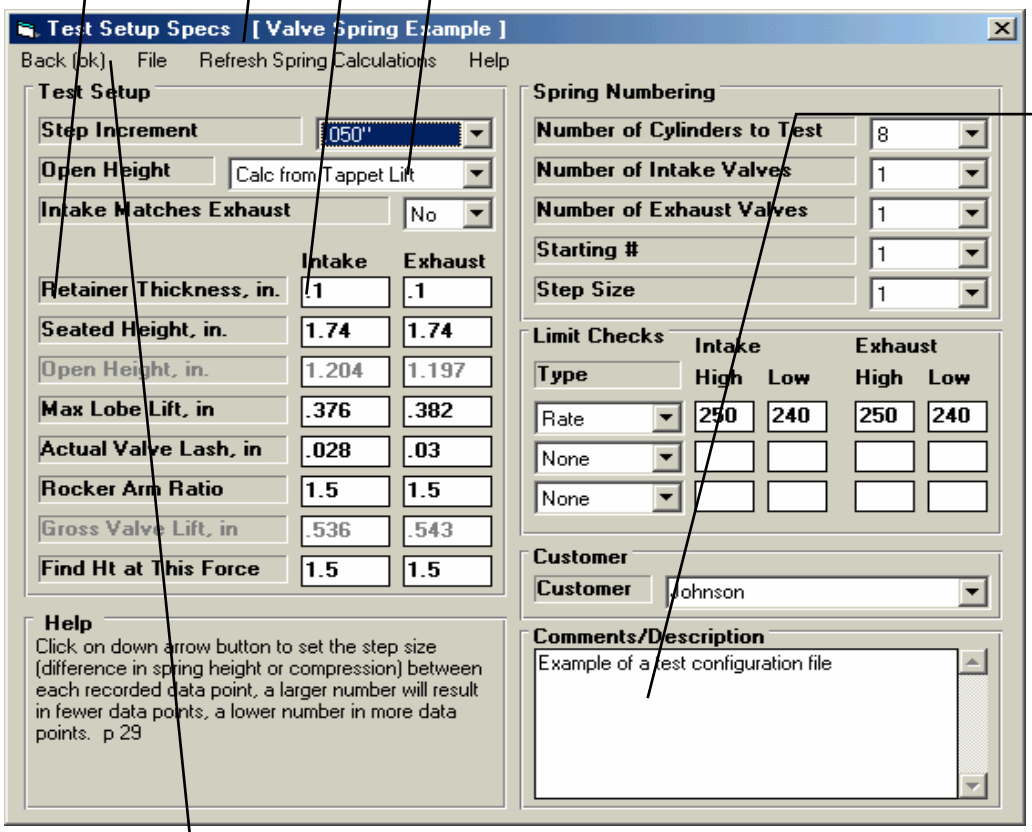
Figure 2.4, Explanation of Sections of Typical Menu

Names of component specs. Click on them for a description in the Help frame in the lower left corner.

Name of component file displayed in this menu.

Standard text entry box where you can type in a number for a spec.

Drop down combo box. For some specs (like Customer in the lower right corner) you can either type something in the box, or click on the arrow button to select a pre-programmed selection. For most others you can only select from a list pre-programmed choices.



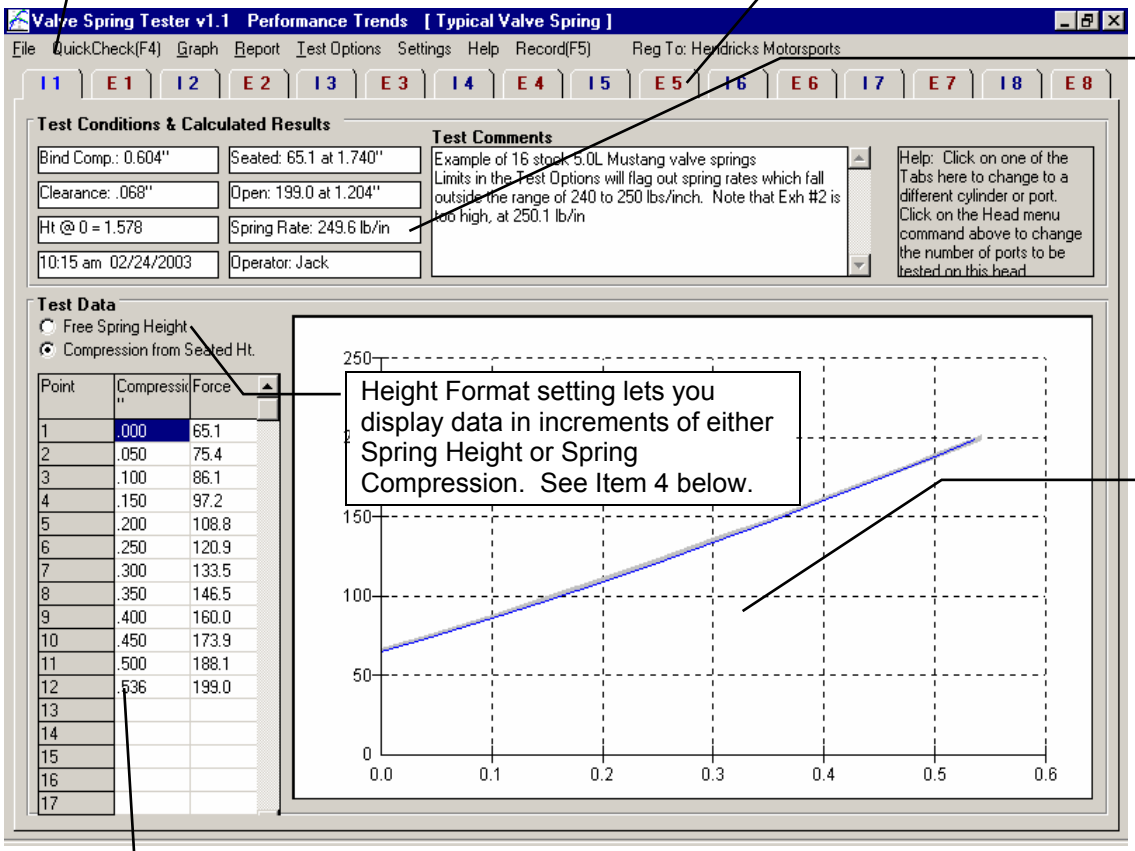

Comment text frame to enter a comment to describe these component specs. These comments are saved with the specs in the Test Options Library.

Standard menu commands which provide the options for closing this menu (Back), saving or open files of these individuals specs (click on File, then Save or Open), erasing a set of specs (click File, then New, printing this screen (click on File, then Print), etc. See the sections later in this chapter for more details on Test Options.

# 2.1 Main Screen (Test Data)

The Main Screen is shown in Figure 2.6. The screen shows you a summary of the spring force and height data for each spring, including calculated data like Seated Force, Spring Rate, etc. You can jump to different springs by clicking on the tabs at the top of the screen. The Main Screen is made up of 5 basic sections as shown in Figure 2.6. These are discussed in the next 5 sections. The rest of this section gives an overview of how a Spring Test is organized.

Figure 2.6 Main Screen After Opening a Test File




## 2.1.1 Tabs

A Spring Test is made up of between 1 to 48 Test Data grids for each spring, each with a tab as shown in Figure 2.6. If you are testing just 1 cylinder, the test will be made up of 1 intake and 1 exhaust Test Data grid. If you are testing for 2 cylinders it is

made up of 2 intake and 2 exhaust Test Data grids, and so on. Figure 2.6 shows how a test for 8 cylinders would look. You move to different springs by clicking on the Tabs at the top of the screen.

You set the Number of Cylinders to test and the pattern for the cylinder numbering in the Test Options menu. You can open the Test Options menu by clicking on the Test Options menu command at the top of the Main Screen. See Section 2.3.

## 2.1.2 Test Results

### Bind Compression

### Clearance

### Height at xx Force or Non-Linearity

### Seated Force

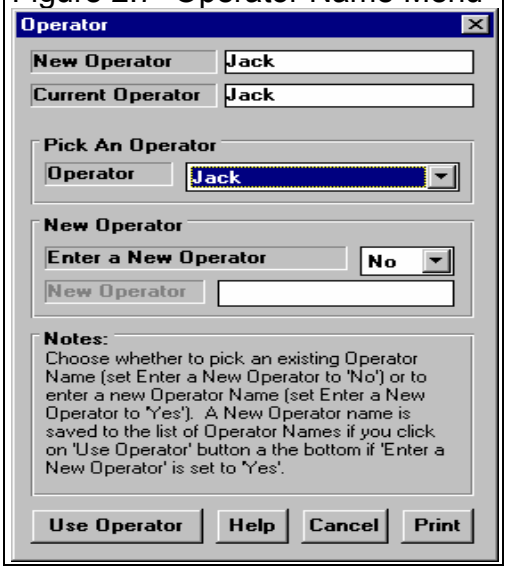
### Open Force

### Spring Rate

These calculated results are the same results that can be displayed in many different Graph or Report types. They are shown here on the main screen as a summary of this springs calculated results. The definition of these results are given in the section Reports, Section 3.2.

### Test Operator

Figure 2.7 Operator Name Menu




This is the name of the operator who ran the test. Click on this item for the menu of Figure 2.7 to be displayed, where you can type in a new operator name, or choose from one you have previously entered. It is always recommended you first check the list of existing operators, so you do not end up with several names for the same operator. For example, Bob, Bobby and Robert may all be for the same guy. When you go to look for tests run by Bobby in the future, the search (Filter option) will not show up the tests run by Bob or Robert.

To pick an existing operator name, pick No for Enter a New Operator, then pick from the Operator list. To enter an New Operator name, pick Yes for Enter a New Operator, then type in a New Operator name, which will be added to the list of operator names.

### Test Comments

Test comments are for making most any notes about the test, unusual observations, customer requirements, etc. In the Pro version, you can search the Comments for various words. For example, you could search for all the tests which had the word “unstable” or “titanium” in the Test Comments.

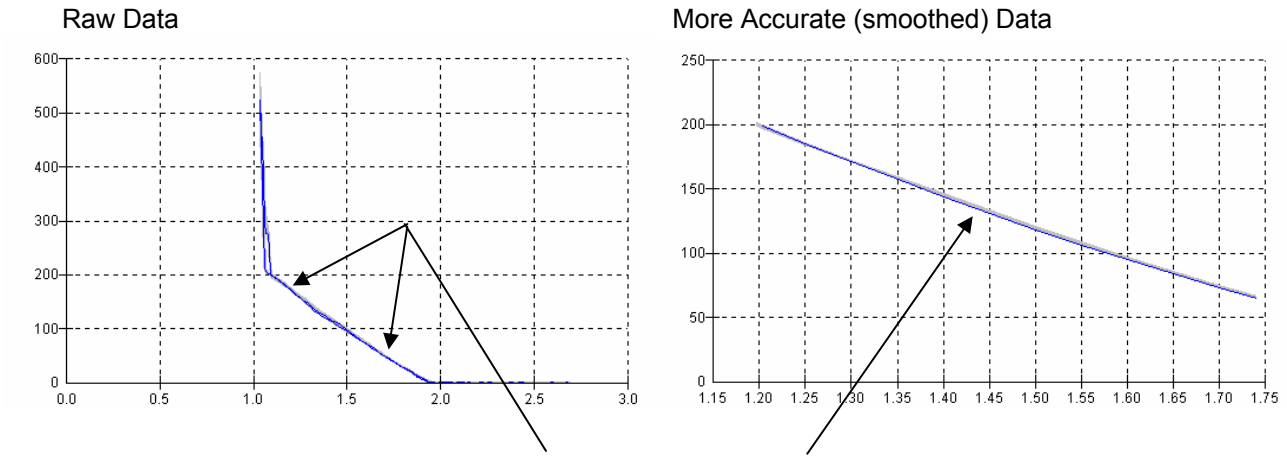
### Help

The help frame will describe what ever portion of the screen the mouse has passed over or clicked on. For example, click on a location in the Test Data grid, and a description of what data can be entered in that particular column is given.

## 2.1.3 Summary Graph

The summary graph shows Spring Force (versus either Spring Height or Spring Compression, depending on the Height Format option you have selected) for all springs (Figure 2.6). This is an excellent way to show if the data between the different springs is agreeing well. It does take more time for the program to graph all springs. On slower computers you may want to change the Preference "Main Screen, Other Cyl. Springs" to No. This will result in faster updating of the Main Screen but graph only the data for the spring you are working on.

Figure 2.8 Comparing the Same Data with Different Preference Settings "Graph Raw Data"




The Preference menu also lets you to select to either graph the Raw data (good for debugging problems) or the Calculated data, which is more accurate and repeatable. See Figure 2.8.

If you click on the Summary Graph, the Graph Options menu pops up to provide many more graphing options for the more detailed Graph screen.

## 2.1.4 Test Data Grid

### Spring Height Format

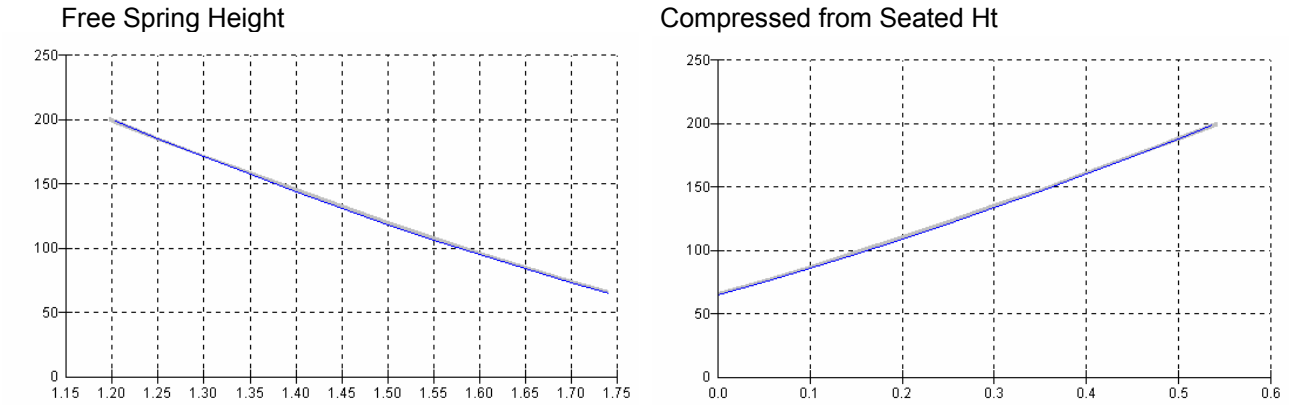
- Free Spring Height
- Compressed from Seated Ht

These option buttons control a very important aspect as to how the program presents and analyzes data for calculated results, graphs and reports.

**Free Spring Height** This is the height of the spring as measured by a ruler. As you compress the spring, this height goes down.

**Compressed from Seated Ht** This is the amount the spring has been compressed from its seated or installed height. This is how the engine sees the spring. For example, at a valve lift of .550, the Compressed from Seated Ht is .550. As you compress the spring, this "Compressed" number goes up.

Figure 2l9 Comparing the Same Data with Different Spring Height Formats




### Point

The point column simply numbers the rows of data

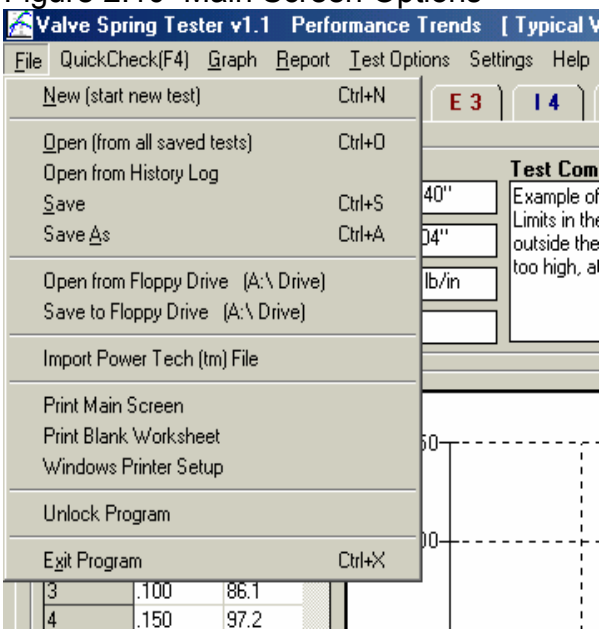
### Compression or Height

This column shows either Spring Height or Spring Compression, depending on the Height Format option you have selected above the grid. The increment size for the grid is set in the Test Options screen.

### Force

This is the spring force at the various increments of Compression or Height.

Figure 2.10 Main Screen Options




## 2.1.5 Main Screen Commands

The next section discusses some of the commands available at the top of the Main Screen. Most will not be discussed here in detail, as they are discussed in other sections of this manual.

## File (see Figure 2.12 for File Options)

### New (start new test)

Click on File, then New to start a new test. This process will "walk you through" some critical steps to start with a blank Test Data grid, or to keep certain data from the previous test. Keeping data can save you considerable time since you don't have to type in information which may be the same as the current test. The New Test command is discussed in full detail in Section 2.6.

## Open (from all saved tests)

This option presents the Open Test File menu discussed in Section 3.6, Data Libraries. From there you have several options to open a previously saved test file from any place in the Test Library, or from most any place on the computer, including the floppy disk drive.

## Open (from History Log)

This option presents the History Log, a chronological list of test files you have been working with as discussed in Section 3.8. From there you can review a summary of the last 25 to 100 tests, and pick one to open. This method can make it easier to find a file you have just worked with lately, say in the last couple of weeks.

## Save

Select Save if you want to save the current test and any recent changes ***to the same name*** as you are currently working with. This is the file name shown in square bracket [ ] at the top of the Main Screen.

## Save As

Select Save As if you want to save the current test and any recent changes ***to a new name or new folder***. You will be presented with the menu discussed in Section 3.6 where you can change the test name, change the folder you are saving it to, or add a new folder name.

## Open from Floppy Drive

This command provides a simple 1 click command to open a standard Windows “File Open” menu displaying the contents of the disk in the Floppy Drive. This provides a convenient method for copying files from one computer to another.

## Save to Floppy Drive

This command provides a simple 1 click command to save the current test file to the disk in the Floppy Drive to the same name as is currently being used. This provides a convenient method for copying files from one computer to another.

## Import Power Tech ™ Files

The Spring Tester can read flow files from the DOS Power Tech (tm) spring tester software. You can either copy these Power Tech files to a folder in the SpringData folder in the Spring-V folder. Then when you click on this file to open it (via the normal File, then Open (from all saved tests), “Power Tech” will be displayed in the 'Preview' section, and you can click on 'Open' to open it. Using the Advanced open feature, you can click on most any file on your computer. The program will automatically make all conversions necessary.

### Print Main Screen
### Print Blank Worksheet
### Windows Printer Setup

The Print Main Screen and Print Blank Worksheet commands simply give you instructions how to do each. These commands were placed under File as many users will look under File to find these print options. The Windows Printer Setup lets you change your Windows default printer, paper orientation, etc for printing reports or graphs in other areas of the program.

## Unlocking Program:

The Valve Spring Tester has some minor copy protection. This ensures the legitimate users do not have to cover the costs for unauthorized distribution of the program. See Section 1.4 for details.

## Quick Check <F4>

Click on Quick Check or press the <F4> key to perform a simple test on most any spring. This can be done at most any time, with most any test currently on the main screen or during the middle of the test you are currently running. See Section 2.5 Quick Check on page 37.

## Graph

The Graph command lets you graph several different types of data from the current test, either by itself or with data from other tests for comparisons. The Graph options are discussed in detail is Section 3.4, page 55.

## Report

The Report command lets you create reports of several different types of data from the current test, either by itself or with data from other tests for comparisons. The Report options are discussed in detail is Section 3.1, page 49.

## Test Options

The Test Options command opens up the Test Options menu. There you tell the program critical spring specs, like Seated Height, Open Height, whether the Intake and Exhaust spring specs are the same or different, spring numbering, and any checks to make to the data to “flag out” springs which may be outside allowable limits. Test Options are discussed in detail in Section 2.3, page 23.

## Settings

The Settings menu opens up 2 critical Menu commands, Tester Calibration and Preferences. These are described in the following paragraphs.

## Tester Calibration

The Tester Calibration command opens up the Tester Calibration Specs menu, where you can describe the spring tester you are using.

> ***The specs in the Tester Calibration menu are critical for accurate results. Be sure to read and understand the Tester Calibration Specs as discussed in detail in Section 2.4, page 41.***

## Preferences

Preferences let you customize the program for your needs and for your computer and printer. See Section 2.2, page 21.

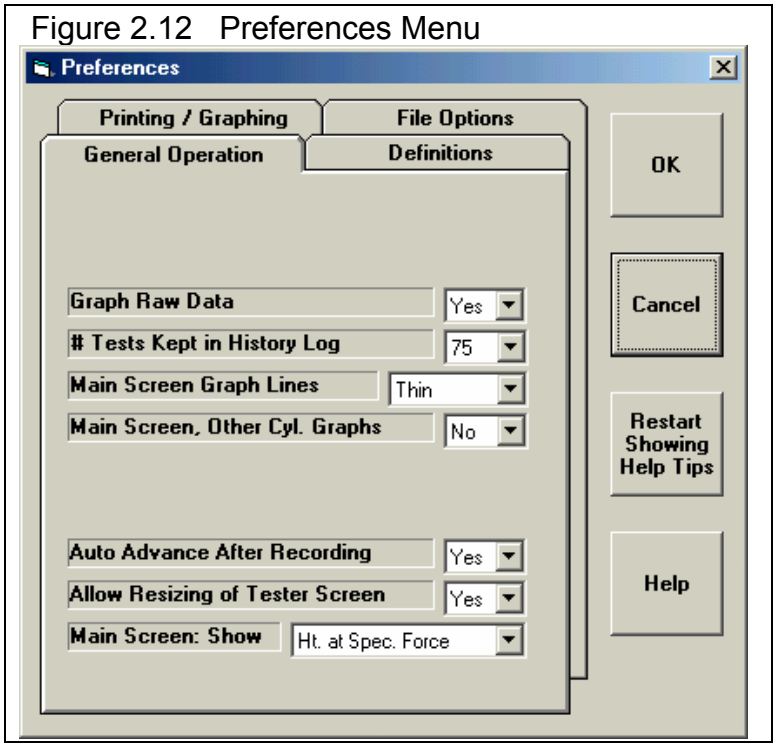
## Help

Click on Help for several options to help describe your options at the Main Screen, and for other information to help you understand how this program works.

> **IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

# 2.2 Preferences

Figure 2.12 Preferences Menu




Click on the Preferences item in the menu bar at the top of the Main Screen to bring up the Preferences menu shown in Figure 2.12. Here you can adjust some program items to personalize the program for your needs. Preferences may also save time by eliminating steps you don't require.

## Graph Raw Data

Set this to Yes to see the actual data being recorded, both during compression and expansion of the spring. This is very useful for troubleshooting problems with the spring tester.

Set 'Graph Raw Data' to No to see the data after it has been smoothed to follow a normal spring curve. This will be a graph of the data being reported in the Data Table to the left of the graph. This is the same data on which all calculated results like Open Force, Spring Rate, etc are based, and on which all graphs and reports are made.

## Main Screen, Other Cyl. Graphs

Choose Yes to graph all cylinders for the data entered on the Main Screen. This provides an instant review that all data is consistent from point-to-point and spring-to-spring. Choose No to only graph the data from the current spring you are working with. The only real advantage of choosing No is to save time refreshing the Main Screen on slower computers.

## # Tests Kept in History Log

Pick the number of tests which you want the History Log to hold, from 25 to 100.

## Main Screen Graph Lines

This option lets you choose the line thickness of the summary graph of force vs spring height for all the springs on the Main Screen.

## Auto Advance After Recording

Set this to Yes and the program will automatically jump to the next spring after testing a spring (if no errors were found in the tested springs results). This can save time and keystrokes, but may not let you review the results of the spring just tested.

## Allow Resizing of Tester Screen

Set this to Yes to allow you to enlarge the program's Electronics screen showing Tester Results when you test a spring.

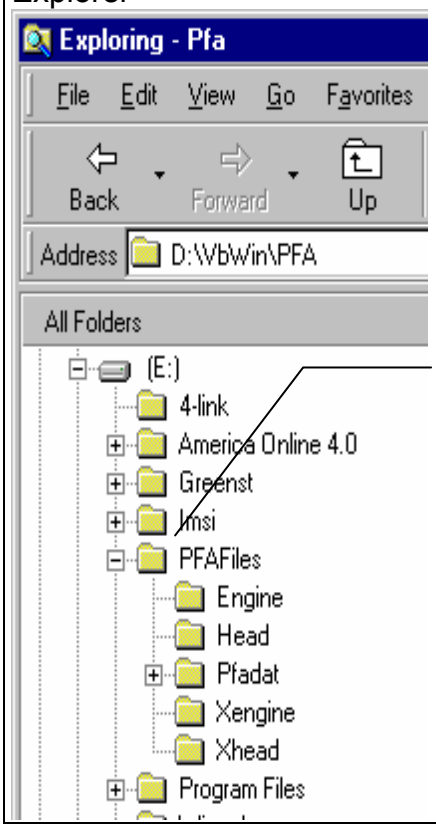
## Main Screen Show

Due to space constraints on the Main Screen and in the Tester Screen, you must choose which is more important to display of either 'Linearity' or 'Force at a Specified Height'. This is done via the setting 'Main Screen Show'.

## Program Title Comments

Enter most any text here for the First and Second lines. These 2 lines will appear at the top of printouts and printed graphs. This is a good place for your business name or your personal name. You can change these entries as often as you wish.

Figure 2.13 Alternate Path in Windows Explorer




## Use Alternate Location for Files

Some users (typically those on a network) may need to store their data files in a location other that in the Spring-V folder (the folder containing the actual Valve Spring Tester program). For example, you may want to put the files on the E drive so other computers can access them. If so, choose Yes and then the spec Path to Files will be enabled.

> ***In most all situations (except for network users) it is STRONGLY recommended you keep this marked No.***
>
> ***It is also STRONGLY recommended that if you do choose Yes, that you do NOT keep changing this back and forth from No to Yes. This will produce possible errors when saving or opening files. This will be due mostly to saving them in one location and then looking for them in another location.***

## Path to Files

If you set the previously described Use Alternate Location for Files spec to Yes, this spec becomes enabled. Enter the full path to the new location for the Valve Spring Tester data files. For example, if you want to store the files on the E drive, enter the path:

E:\PFAFILES

Either before you make this change in the Preferences menu, or immediately after that change, you must copy all Valve Spring Tester data folders (directories) and data files to the new location. These folders include:

Spring Test Library (the SpringData folder and all subfolders)
Test Options Library (Test Options folder)

Assuming you used the path E:\PFAFILES, you must copy the SpringData and Test Options folders (and their contents, the data files) to the PFAFILES folder on the E drive. See Figure 2.13.

***You must copy both folders listed above and their contents (files) to the new location to avoid errors.***

***It is also STRONGLY recommended that you do NOT keep changing the path. Once you set it, do NOT change it. Constantly changing it will produce possible errors when saving or opening files. This will be due mostly to saving them in one location and then looking for them in another location.***

***If this process seems complicated or you are not familiar with Windows copy commands or folders, DO NOT use this option. Keep the spec Use Alternate Location for Data Files set to No.***

## Default Floppy Disk Drive

Choose the letter of the floppy disk drive on your computer, usually A . This is the disk drive which will be first opened when using the Save to Floppy Disk or Open from Floppy Disk File commands at the Main Screen.

## Printer Fonts

Choose which basic type of font to use for printouts. You may not get your choice if your printer does not support that particular font.

## Printed Graph Width, % of Page

Due to the endless combinations of computers, Windows setups and printers, some printed graphs may not fill the page, some may extend off the page. This option lets you expand (% greater than 100) or shrink (% less than 100) the printed graph to better fit the page.

## Graph Dot Matrix Printer Adjustment

Choose Yes if you are getting breaks in the border around printed graphs (usually happens with dot matrix printers).

## Test Folder Name in Program

The Valve Spring Tester Analyzer saves tests under different folders (directories) under the main folder SpringData. Some users may prefer to have the 'Folder' be called 'EngFamily' or 'Customer', depending how they choose to organize their tests. Your entry here of most any text is what the program will use to call the different folders where test files are stored.

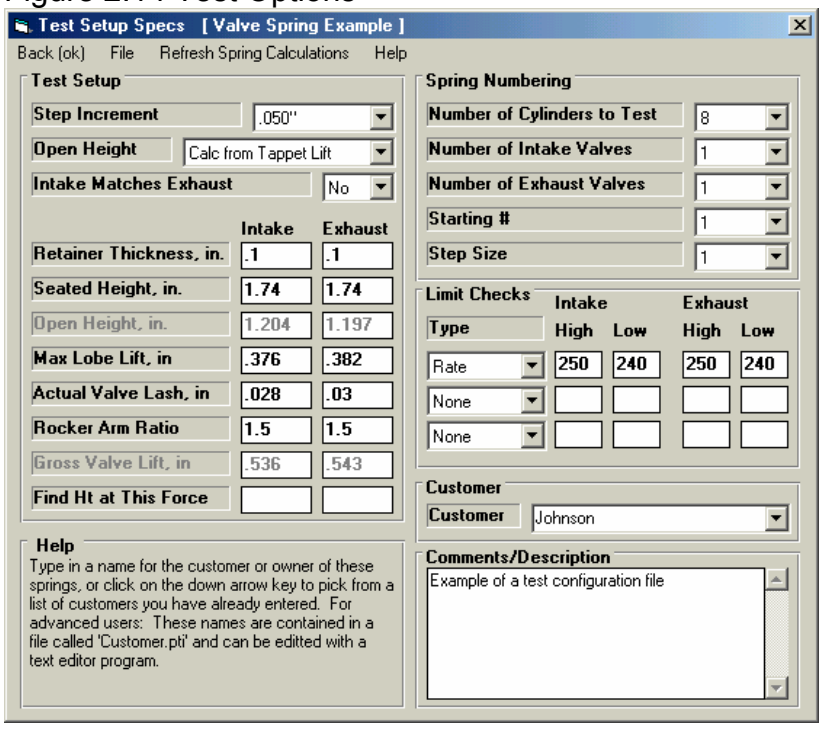
**IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

# 2.3 Test Options

This menu contains several critical specs which determine:

1. How the spring is analyzed (critical spring heights, forces, etc.)
2. How many springs are to be measured and how they are numbered.
3. Any limits you want the program to check the springs for and "flag out". Results outside of these ranges are identified with a "<" if the spring is below the limit, or a ">" if the spring is above the limit. These will appear in the reports or on the main screen, which also highlights this result in Red.
4. General info like customer name and comments describing these test setup specs.

Figure 2.14 Test Options




As you click on each input spec or input name, a brief description is given in the "Help" box in the lower left corner. These help descriptions give very useful information to understanding how these inputs work.

There are 2 basic ways to enter or change specs in this menu:

1. You can click on a spec value and change the current setting or type in a new one. If your entry is outside the typical range, a message is given showing the limits, and the setting is switched back to its original value.
2. Some specs are picked from a list called a "Combo Box". An example would be "Intake Matches Exhaust", where there are 2 choices either Yes or No. Click on these specs or the "down arrow button" to the right of the specs to be presented with the list, then click on your choice from the list. (Customer name is somewhat different and is described in an upcoming screen.)

As critical specs are changed, the results of the test may need to be updated. For example, if you change 'Seated Height', the Force at this height will change (and so too may Spring Rate and Linearity). This is designed to happen automatically when you leave this screen. However, if you suspect that the results have not been updated, you can click on 'Refresh Spring Calculations' at the top of this screen to force this to be done manually right now.

Additional useful inputs include the Customer name and Comments. These are useful for keeping tests organized and for finding past tests. As stated earlier, this data can be used for finding past tests which meet certain criteria, like all tests for Customer 'Johnson'. Click on File at the top of the main screen, then Open from All Tests, then the Filter button for more info on this feature.

Click on the down arrow key for Customers to pick from a list of previous customer names you have entered, or just type in a new customer name. It is recommended you always check the list first and use a currently listed customer. This ensures

conformity in your tests and makes it easier to find tests for certain customers in the future. (To delete names from the customer list, use a text editor like Windows Notepad or Wordpad with the file CUSTOMER.PTI)

A very useful option is the ability to Save sets of Test Options to the Test Options Library, and Open (retrieve) these specs in the future. Click on File at the top of this menu to see these options.

You can choose most any name for a Test Options File when you Save it. This name appears at the top of ***this*** Test Options menu in brackets [ ].

Background: When you save a complete Test File at the Main Screen, you are saving everything to the Test Library: the Test Data, Spring Tester Calibration Specs, Test Options, etc. When you click on File in this menu, then Save or Save As, you are saving only the Test Options to a separate Test Options Library. Retrieving these Test Options in the future, like when you start a new test on a similar set of springs, can save considerable time because you don't have to type in all the specs again.

Another option includes the ability to print this screen (click on File to see these options).

## Step Increment

Click on down arrow button to set the step size (difference in spring height or compression) between each recorded data point, a larger number will result in fewer data points, a lower number in more data points.

## Open Height

Click on down arrow button to set the method for calculating the Spring Height at maximum valve lift for this particular engine. You can either enter this Spring Height directly, or calculate it from Cam and Valve Train specs 2 different ways (3 different choices total). Your choice here will enable or disable many different inputs in this section.

## Intake Matches Exhaust

Click on down arrow button to select whether the intake specs in this screen match the exhaust specs. Selecting Yes will hide all Exhaust specs in this section.

## Retainer Thickness, in.

This is the thickness of the valve spring retainer. The actual spring height + retainer thickness = spring height measured on the spring tester. Enter this only if you include the spring retainer when you test the valve spring. Otherwise, set this to 0 if you do not use the retainer when testing the spring.

## Seated Height, in.

The height of the spring when installed under the spring retainer with the valve on its seat (closed).

## Open Height, in.

This is the height of the spring at its fully open point. The difference between Seated and Open height is equal to valve lift at its maximum lift.

## Max Lobe Lift, in

Max tappet (cam) lift (not valve lift) above base circle.

## Actual Valve Lash, in

This is the actual clearance lash at valve in inches. Cam may be designed for a different lash.

## Rocker Arm Ratio

This is the ratio of valve lift to tappet lift, usually 1.3-1.8 for rocker arm systems. For direct acting systems enter 1.

## Gross Valve Lift, in

Valve lift assuming 0 valve lash, which is the rating used by most cam grinders.

## Find Ht at This Force

This is the spring height or compression (depending on the Spring Height Format setting on the Main Screen) which produces the spring force entered here.

## Number of Cylinders to Test

Click on the down arrow button to select the number of cylinders for which springs will be tested. For example on an inline 4 cylinder, this would probably be 4, for a V-6 this would probably be 6.

## Number of Intake Valves

Click on the down arrow button to select the number of intake valves for each cylinder, typically 1 for a 2 valve engine, 2 for a 4 valve engine.

## Number of Exhaust Valves

Click on the down arrow button to select the number of exhaust valves for each cylinder, typically 1 for a 2 valve engine, 2 for a 4 valve engine.

## Starting #

Click on the down arrow button to select the first (usually the lowest) cylinder number which will be tested.

## Step Size

Click on the down arrow button to select the difference in cylinder # between adjacent cylinders.

## Menu Commands

The menu bar at the top provides for several command options, some which are fairly self explanatory:

- Back (ok) returns you to the Main Screen.
- File opens up several typical Windows options . You can open and save these Test Options specs as separate files. This allows you to easily change these specs to match a different head with only a couple of clicks. See Section 3.6, Data Libraries.
  - New will blank out all the Test Options, Comments; and the File name will be called “Untitled”.
  - Open Saved Test Options File will open a typical Valve Spring Tester “File Open” menu, where you can pick a set of Test Options Specs which ***you*** have saved, using the Save command in this menu.
  - Save Test Options File will open a typical Valve Spring Tester “File Save” menu, where you can save the current set of Test Options and Comments under a name of your choosing. This name then appears at the top of the Test Options menu. This name should not be confused with the Test File Name which appears at the top of the Main Screen. The Test File includes all the Test Options and Spring Data, and therefore includes the Test Options Name.
  - Print lets you print this screen.
  - Windows Printer Setup lets you change printer selection, paper orientation, etc.
- Help brings up a series of help screens on the Head Specs menu.

## Customer

Click on the down arrow of Customer to be presented with a list of customers you have previously used. You can pick one of these customers, or type in a new one. New ones are saved by the program and added to the list.

For Advanced Users: To delete or change customer names in this list, use Wordpad or Notepad and edit the 'Customer.pti' file in the Spring-V folder, but keep a backup in case you make a mistake.

## Comments

Type in comments to help describe these valve spring specs if you want. These comments are saved with the Test File, with the Test Options File if you save the Test Options File, and can be printed out with the Test Options Specs when reports are printed.

# 2.4 Spring Tester Calibration Specs

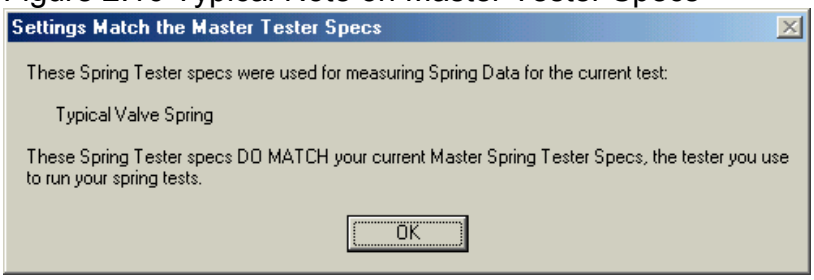
The Spring Tester Calibration Specs describe the tester you are using and calibration specs for converting electrical signals into spring force and height. These specs are critical for accurate data, therefore be sure these specs are correct for each test.

## Master Tester Specs

A critical concept for Tester Calibration Specs is the idea of the Master Tester Calibration Specs. When you run a test, you are using a particular tester, with certain Tester Calibration Specs. When you save the test, the program saves a copy of the Tester Calibration Specs with the test. Let's call this test "April 12" and assume it was run on April 12th.

Let's say several months later that you recalibrate your tester. Your current tester specs do not match the specs for "April 12". If you open "April 12", the program installs the tester specs which you used on April 12th when you ran the test.

Figure 2.16 Typical Note on Master Tester Specs




If you go into the Tester Calibration Specs menu, you will likely get a message shown in Figure 2.16, saying that the Tester Calibration Specs for April 12 do not match your ***Master Tester Calibration***, the specs for your current tester. You may ask "What are ***Master Tester Calibration Specs?"***

The program keeps track of any changes to Tester Calibration Specs, asking you if these changes should only apply to the Tester Calibration Specs for a particular test, or if these changes represent your actual tester ***right now***, the Master Tester Calibration specs. Whenever, you start a ***new*** test, either based on a previous test or starting completely blank, the Master Tester Calibration Specs are used. Whenever you open an old test file, the tester calibration specs used for that particular test are used.

Since each complete test you run keeps a set of Tester Calibration Specs, you can easily see what calibration specs were being used at most any time in the past. Simply open an older test, click on Settings, then Tester Calibration to view these specs. If you want to return your tester's calibration to these previous specs, simply click on File, than Save as Master Tester Calibration specs. Now all new tests you run will use these calibration specs.

Changing calibration specs will not affect data which has already been recorded, just new data.

## Sensor Specs

If you purchased a complete Valve Spring Tester system from Performance Trends, you probably got a calibration sheet with it. Then you can type in these numbers on this screen for an accurate calibration.

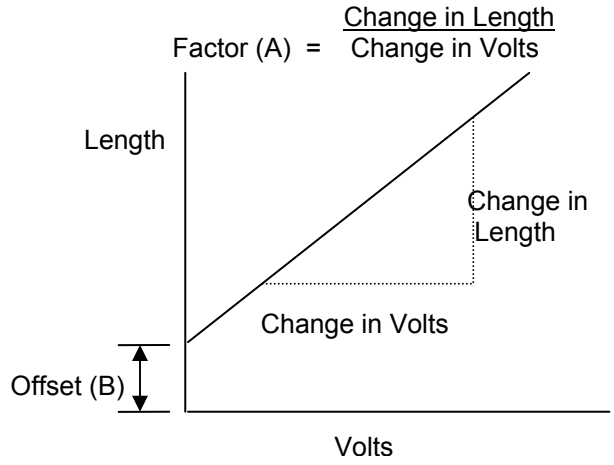
## Length Sensor Offset

This is the offset in the calibration curve for the Spring Length Sensor. In a calibration curve of 'Compression=A*Volts+B', the Offset is the 'B'. Click on the 'Calibrate' button to calibrate sensor through the electronics. See Figure 2.17

## Factor

The factor in the calibration curve for the Spring Length Sensor. In a calibration curve of 'Pres=A*Volts+B', the Factor is the 'A'. Click on the 'Calibrate' button to calibrate sensor through the electronics. See Figure 2.17

Figure 2.17 Definition of Factor and Offset




## Comment

Some comment to describe the calibration of the Spring Length Sensor. Click on the 'Load Date' button to load the current Time and Date as the comment.

## Sensor Offset

The offset in the calibration curve for the Force Sensor. In a calibration curve of 'Pres=A*Volts+B', the Offset is the 'B'. Click on the 'Calibrate' button to calibrate sensor through the electronics. See Figure 2.17

## Factor

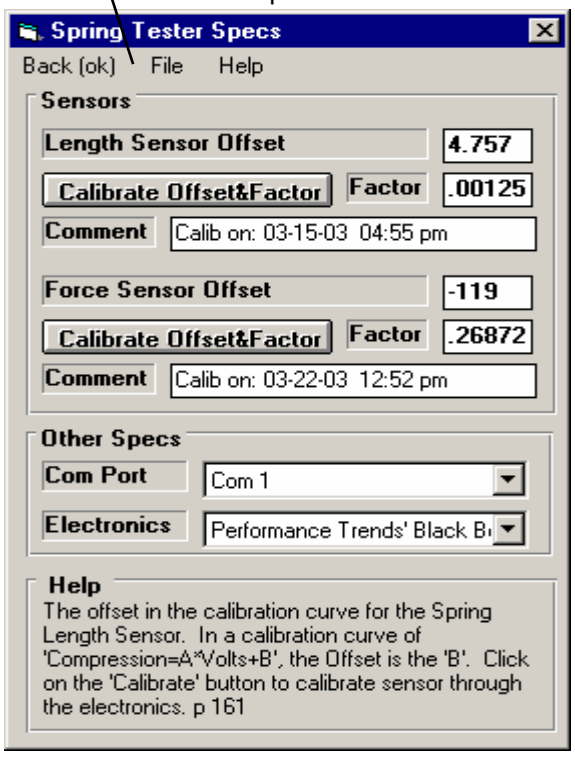
The factor in the calibration curve for the Force Sensor. In a calibration curve of 'Pres=A*Volts+B', the Factor is the 'A'. Click on the 'Calibrate' button to calibrate sensor through the electronics. See Figure 2.17

## Comment

Some comment to describe the calibration of the Force Sensor. Click on the 'Load Date' button to load the current Time and Date as the comment. p 161

Figure 2.21 Spring Tester Specs Menu

Click on File, then:
- Save as My Tester Specs
- Open Master Tester Specs
- Print or Windows Printer Setup to print this screen.




## Other Specs

## Com Port

Click on the down arrow button to select computer's COM (serial) port # you are using to 'talk' to the electronics. It is recommended you select 'Let program find it'.

## Electronics

Click on the down arrow button to select the type of electronics you are using to read the Spring Tester.

## Calibrate Factor & Offset

Click on either of these 2 buttons to perform a calibration. A calibration is required when you first get the tester if it has not been done at Performance Trends. You may also want to check the current calibration if you suspect a problem.

It is strongly recommended that you do NOT recalibrate often. This will often cause more problems than improve data accuracy. If the force sensor does not read 0 (or very close to it) with no spring on the tester, than use the "Re-Zero Force" option described previously in this section.

Figure 2.19 Calibration Procedure for Length Sensor (spring height sensor)

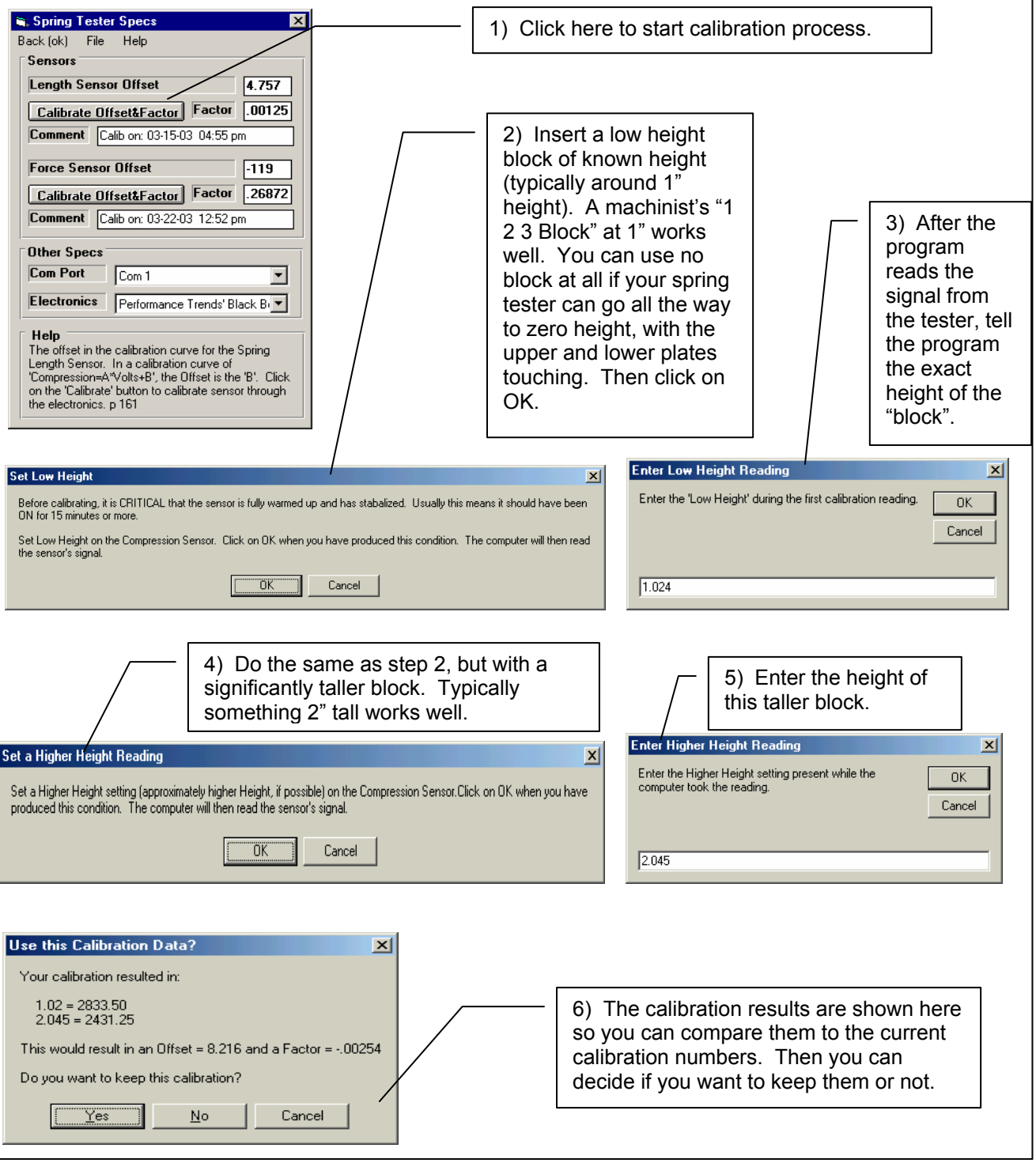
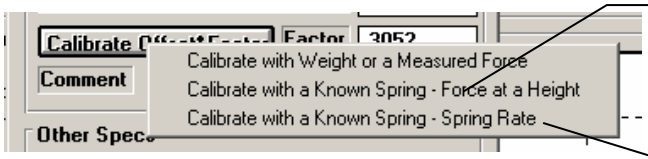
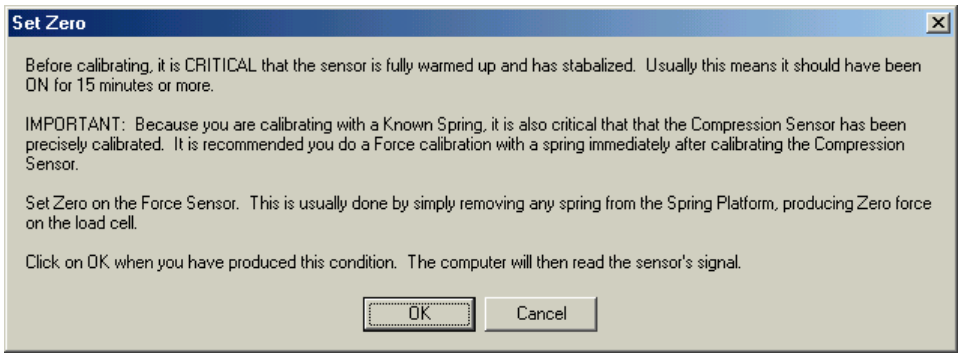


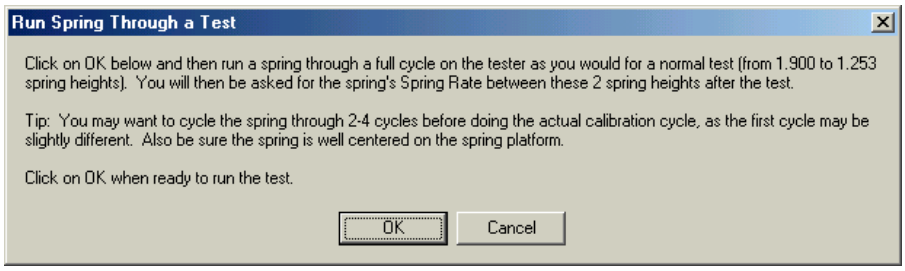
Figure 2.20 Force Calibration Procedure Using a Known Spring

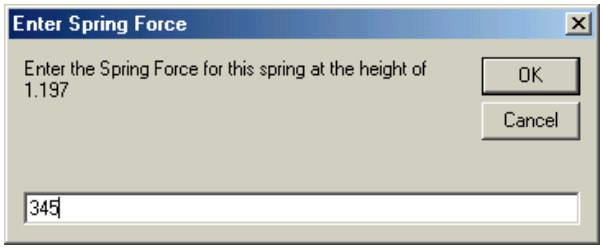



1) Click here to calibrate the force sensor with a known spring. You should know exactly this spring's force at the "Open Height" described in the following screens.

Note: Click here to calibrate using a spring with a known spring rate. This method is not quite as precise as spring rate changes depending on where you are in the spring's travel range.



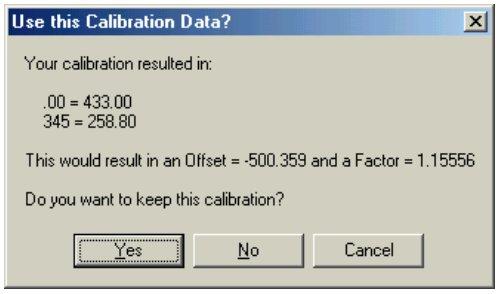
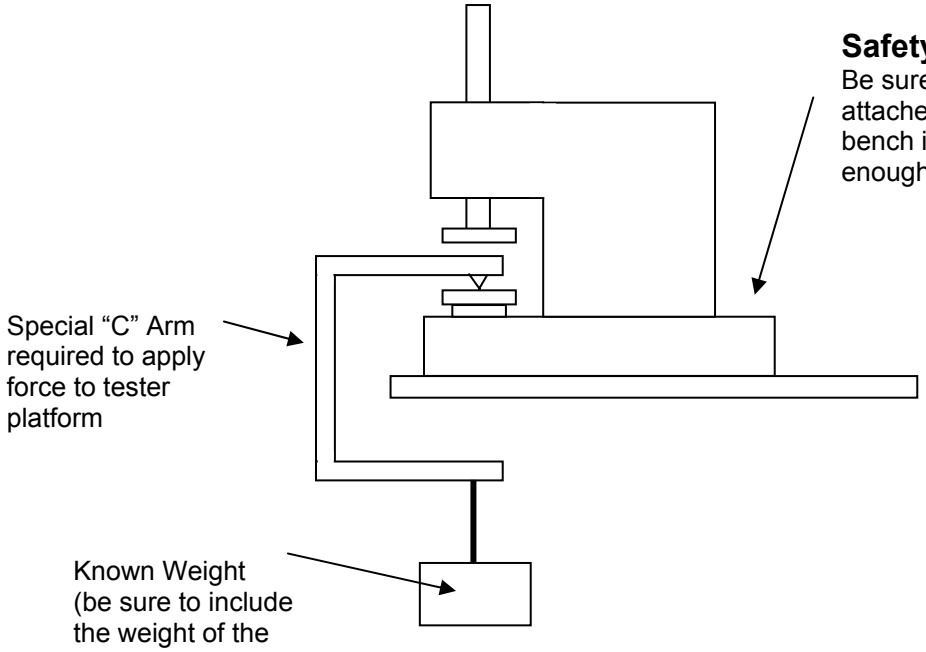



Figure 2.21 Calibrating Force with a Known Weight

This is done much like calibrating the Spring Height sensor. It is typically more accurate that using a known spring, but requires some special fixtures and safety precautions.



# 2.5 Quick Check Test

A 'Quick Check' can be started at most any time (even in the middle of doing a complete test) by clicking on 'Quick Test' or pressing <F4> at the Main Screen. As the name implies, a 'Quick Check' is one where you are only making a quick check of one or several springs and looking for certain specs, like Rate, Seated Force, Bind, etc. No data is permanently recorded for a quick test, unless you print the results on paper by clicking on 'Options' and then 'Print'.

The checking Spring Heights and Retainer Thickness are initially set to the specs in the Test Options for the test on the Main Screen. However, you can change them to most any value you want for the quick check. Any changes you make will not affect any settings for the test on the main screen.

Figure 2.22 Quick Check Screen

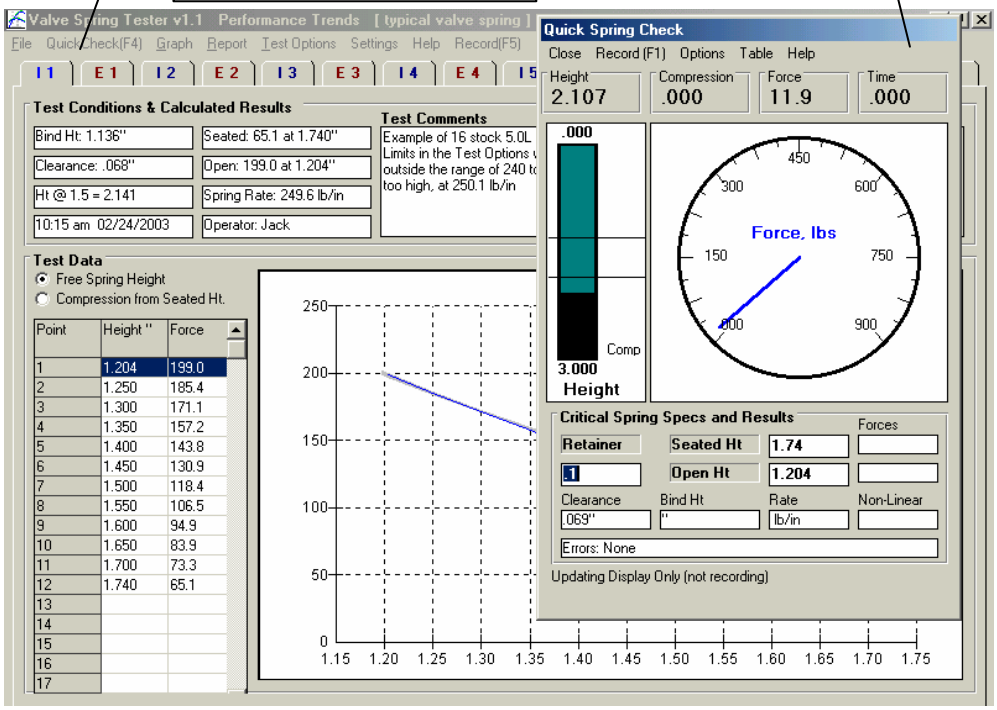
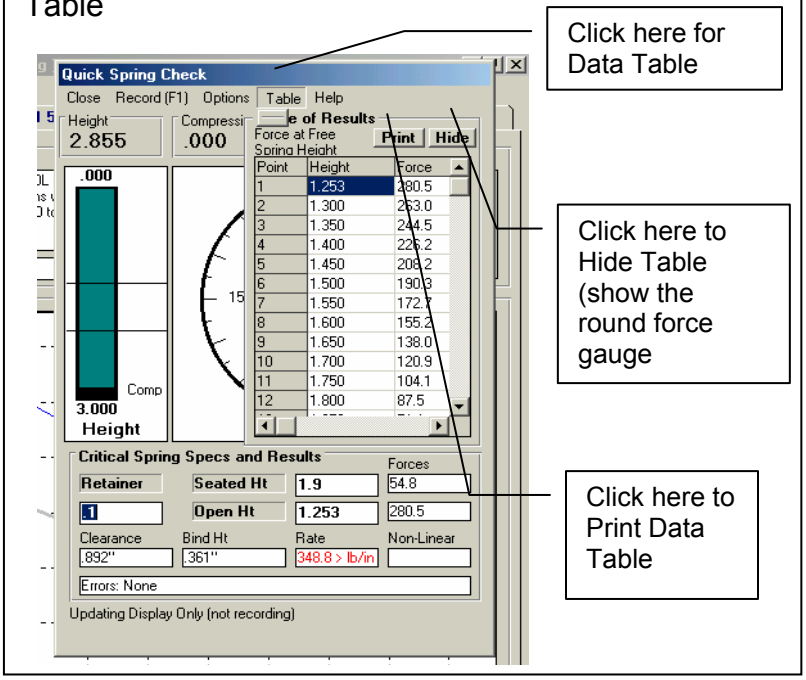



Figure 2.23 Quick Check Screen Showing Data Table




You test a spring the same as for a Complete Test, and the results are displayed on this screen. If you want to view the table of spring force at various lifts, click on 'Table' at top of this screen.

If you want to Quick Check several springs and keep track of each spring's measurements, click on 'Options', then 'Quick Test Several Springs'. Now the program remembers the measurements of up to 50 springs, which are identified as numbers from 1 to 50, which is displayed at the bottom of this screen. At any time after testing some springs, you can click on 'Table', and then choose how to Rank the springs you've tested. Ranking helps you sort which springs are acceptable for a certain application or to 'screen out' bad springs.

Note that the only identification for doing

several springs is the order they were measured. Therefore be sure to keep the measured springs in order or marked with their order.

**Check Appendix 3 for new Quick Check features.**

Figure 2.24 Quick Checking Several Springs

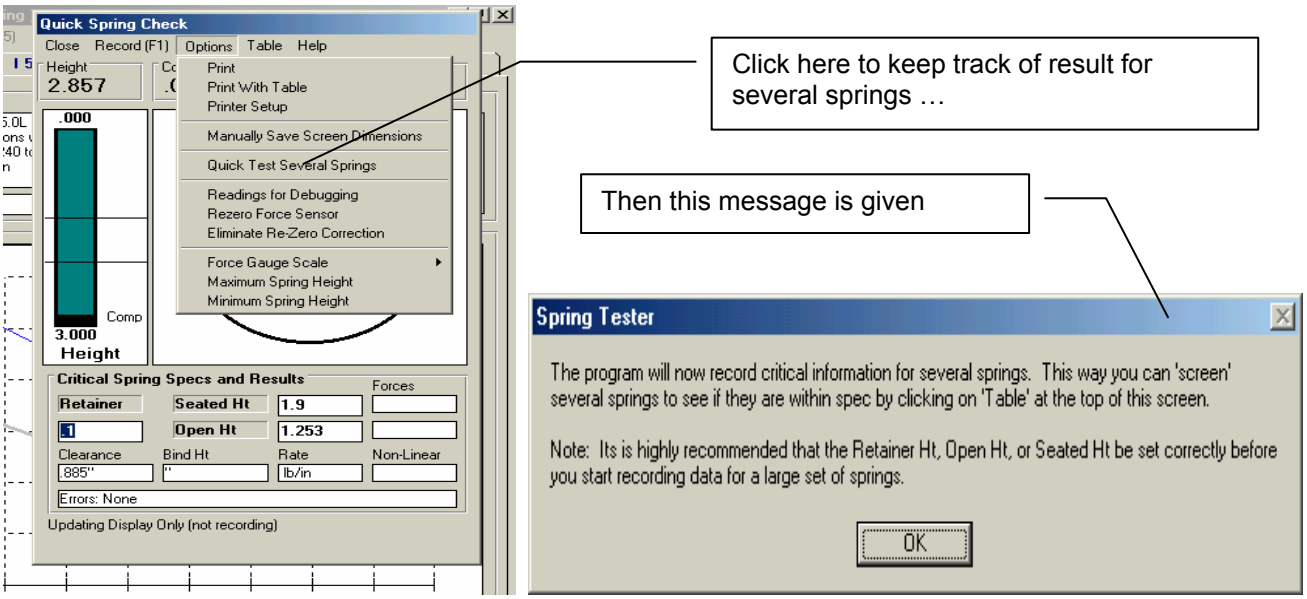
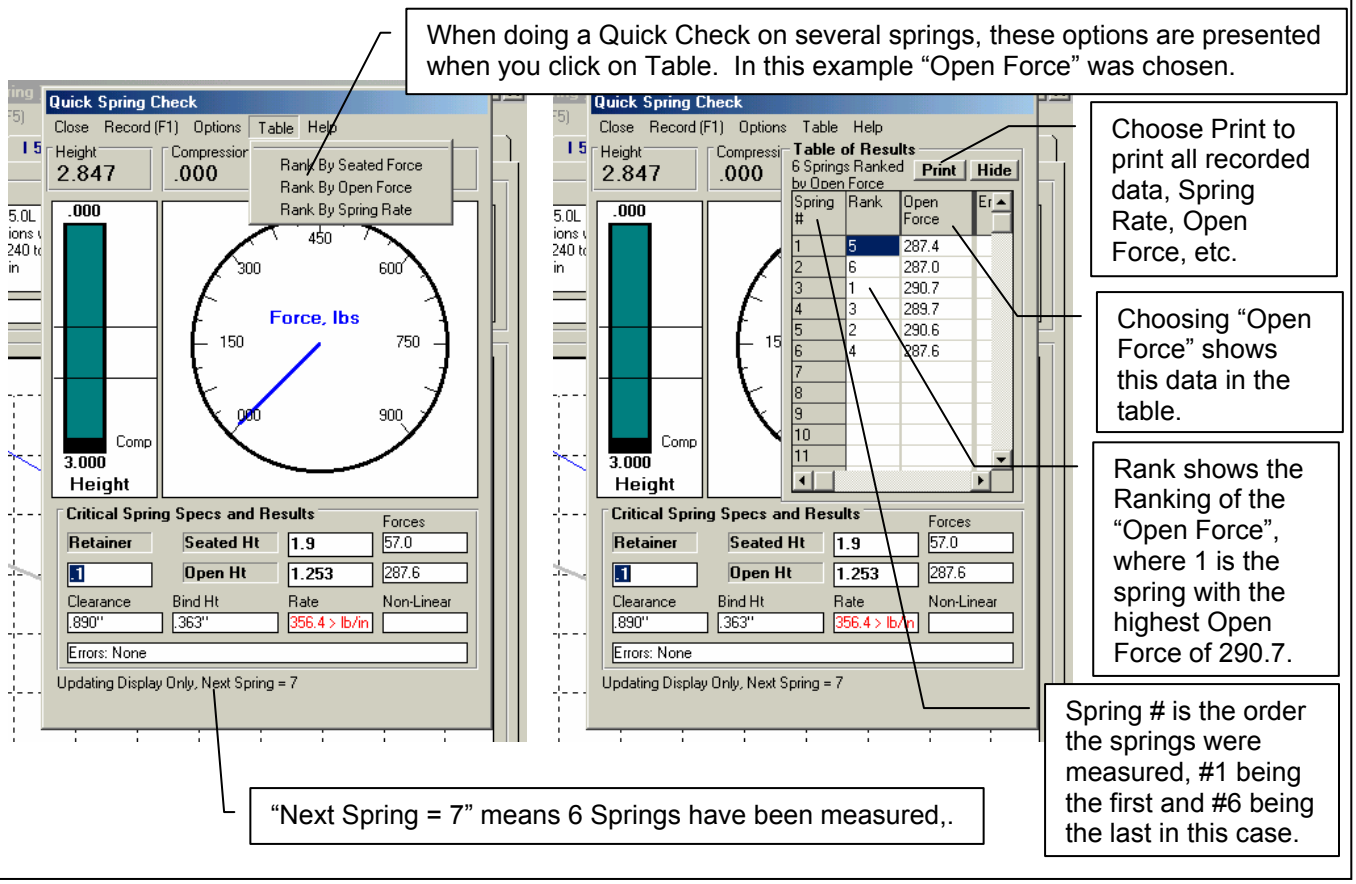



Figure 2.25 Quick Check Results of Checking Several Springs



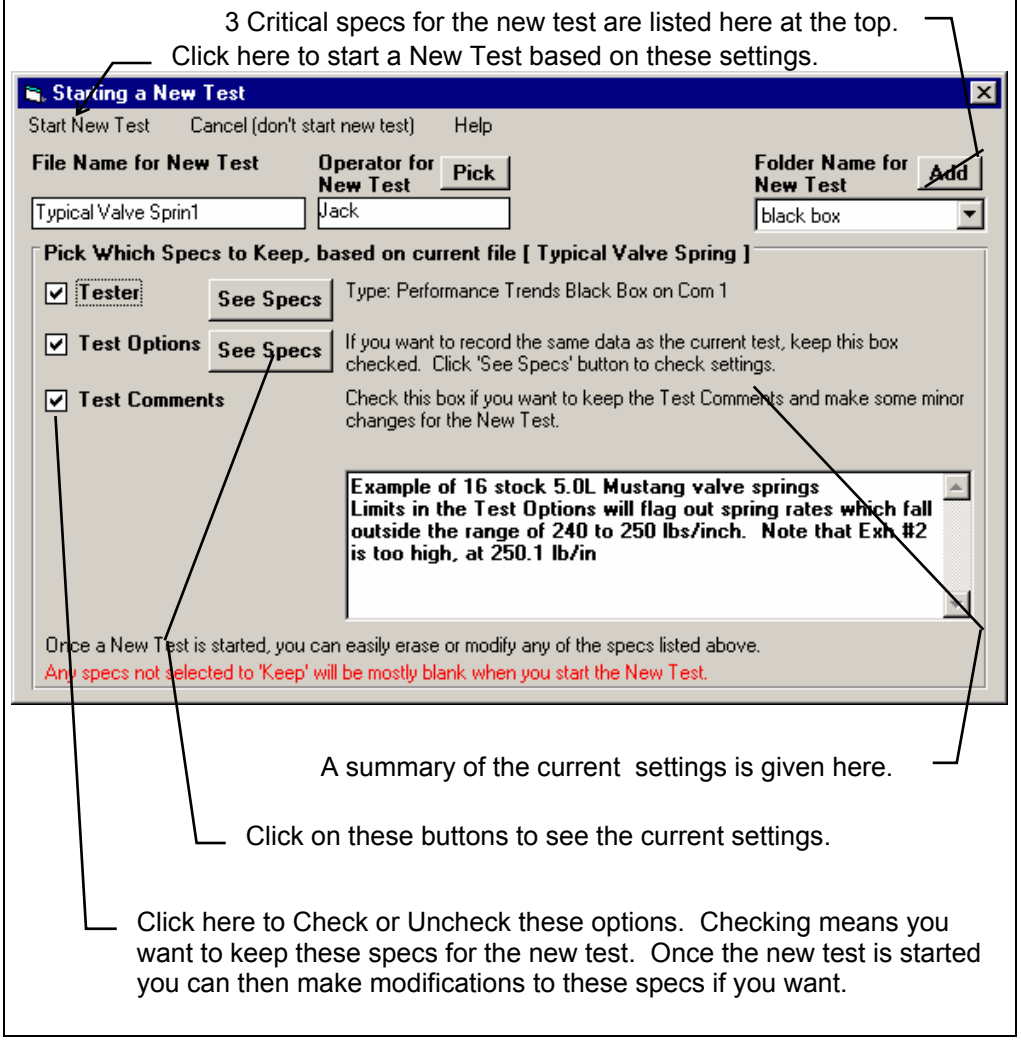
# 2.6 New Test Menu (starting a new complete test)

The New Test command is available by clicking on File at the top, left of the Main Screen, then selecting New Test. You will then be presented with the screen shown in Figure 2.26. Getting a new test started right is probably the ***most important step in running a spring test***.

When starting a New Test, it is usually best to first Open a previous test which is similar to the New Test you will be running (similar spring specs, similar numbering specs, similar limit checks, etc.) This previous test will then be the 'pattern' or 'template' for the New Test and will save you from having to type in many specs to describe this New Test. This also ensures consistency between your tests and reduces the possibility of errors.

If the current test is not a good 'pattern' for this new test (or if there currently is no test displayed), you can abort starting this new test by clicking on 'Cancel (don't start new test)' at the top of the New Test screen. Then click on 'File' at the top, left of the Main Screen and select one of the 'Open' options to open a past test to serve as a pattern.

Figure 2.26 New Test Menu




If you must start with a blank test (which may be the case when you first get this program), or want to modify some specs from the previous test, click on the 'See Specs' buttons for each category of specs. Click on Help at these menus for more info on how to enter these specs.

When you close out these menus, you are brought back to the New Test screen. Be sure to check the check box at the left for all specs you want to use for your new test. ***All*** Categories not checked will be blanked out. Blank specs may cause problems with more detailed analysis, and won't allow you to keep track of important details about the head you are testing.

Most specs in these categories can be changed once the test has started with no problems. This includes specs which simply describe the test and springs which do not affect height and force measurements, like Test Options, Test Comments, etc.

However, specs which DO affect height and force measurements like the Spring Tester Calibration specs, are critical to have correct for even the first data point.

Three other critical specs are listed separately at the top:

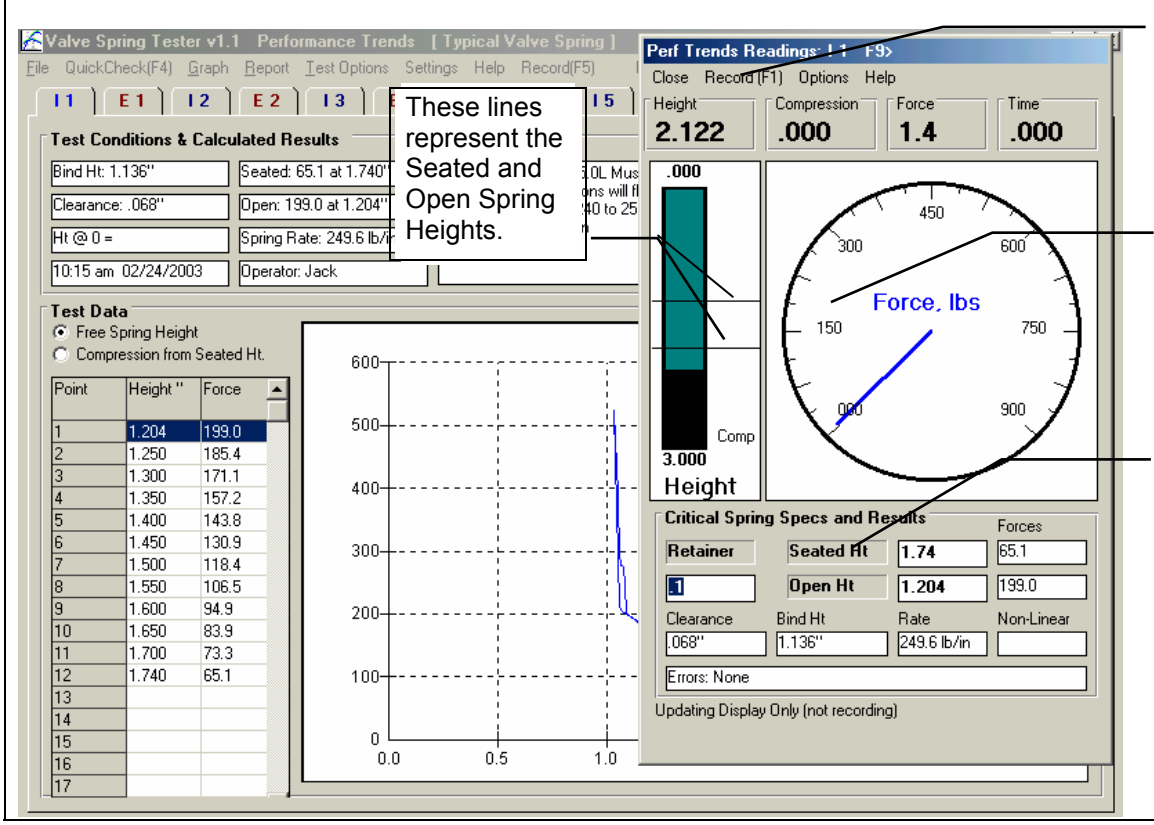
1. File Name for New Test is the file name the program will create for saving the Spring Data for the new test you are starting. The program fills in a default name of the current test name, but incrementing the last digit in the name by 1. You can change this name to most anything you like. The program will warn you if the name entered is not valid and show you what is wrong.
2. Operator for New Test is the name of the operator for this test. Click on Pick to pick an operator name already used or to enter a new name. The program defaults to the operator of the current test.
3. Folder Name for New Test is the folder in the SpringData folder where the test will be saved. The program may not be using the name 'folder' for this spec, but whatever word you have assigned in the Preferences menu at the Main Screen. The folder name 'Examples' is reserved for Performance Trends example tests supplied with the program, and can ***NOT*** be used for your tests.

When you are ready to start the new test, click on 'Start New Test' at the top of the screen. If some critical specs have not been entered, the program will warn you and ask you for it at that time. The program will fill in the Test Time and Date based on the computer's time and date. This can be changed later by clicking on the Test Time/Date at the Main Screen.

# 2.7 Recording Electronic Data from Spring Tester (testing a spring)

This screen shows you the current Spring Tester readings, and lets you automatically record these readings and load them in the Test Data grid. Each time data is recorded, critical Spring Specs like Spring Rate, Open Force, etc are recalculated and displayed on this screen.

Figure 2.27 Screen for Reading Electronics




The data that is displayed here is determined by settings in the Test Options and Preferences screens. Click on 'Test Options', or 'Settings' and then 'Preferences' at the top of the Main Screen to see these options.

You can change the Seated Ht, Open Ht and Retainer Thickness settings shown on this screen by typing in new values and pressing <Enter>. Note that this changes the settings in the 'Test Options' and also updates all results affected by this change for the appropriate springs.

The gauges show the Spring Height/Compression and Force readings. The scales for these gauges can be changed by clicking on 'Options', and then 'Force Gauge Scale' or 'Maximum/Minimum Spring Heights'. The horizontal lines on the Spring Height/Compression gauges show the Seated and Open Heights.

Spring Force should read very close zero with no spring in the tester. If this is not the case, you can 'Re-Zero' the force sensor without doing a full calibration by clicking on Options, then Rezero Force.

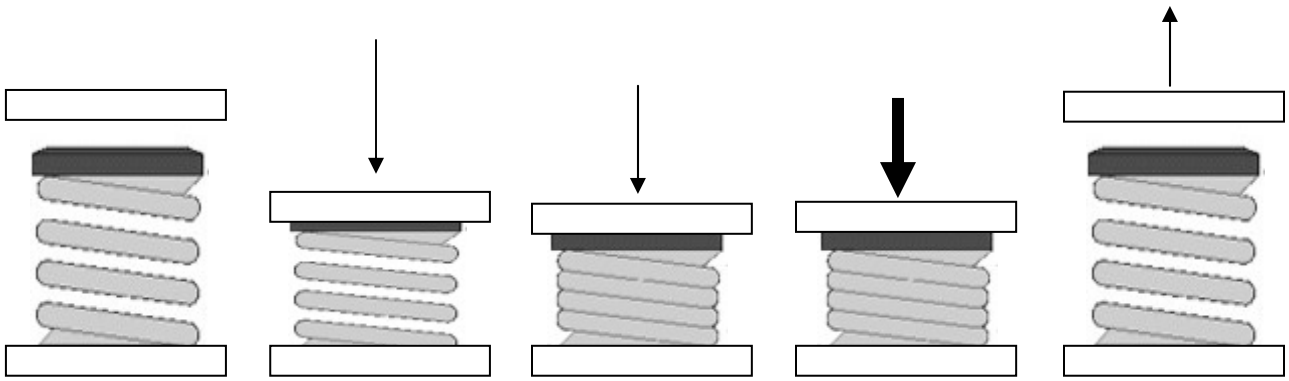
You can switch to other springs by pressing the <F8> key to move to the left to a lower numbered spring or <F9> to move right to a higher numbered spring.

You can resize this screen by placing the mouse pointer over an edge of this screen to get the 'double arrow' pointer, then holding the mouse arrow down and dragging the edge to a new location. You can also reposition this screen by clicking (and holding the mouse button down) on the title bar at the top of this screen (typically blue) and dragging this screen to a new location, then releasing the mouse button. The new screen size and position are used each time this screen is re-opened.

To record Spring Data, you first press the <F1> key with the spring not compressed, preferably with the spring tester not even touching the top of the spring. You compress the spring to coil bind and then add some more force to ensure a good coil bind reading, then return the spring tester back to its original position.

Figure 2.28 Running a Test (shown with a spring retainer)

Be sure to include the spring retainer thickness in the Test Options screen if you measure the spring with the retainer included (as shown here)



1 Place spring on platform. Press <F1> and start compressing.

2 Compress spring in one relatively smooth, continuous motion.

3 Compress to coil bind.

4) Give extra "squeeze" to ensure high force is measured at this point.

5) * Release to approximately starting position and data recording stops automatically.

* Data is recorded during compression and during expansion. For best accuracy, you want to release the spring at approximately the same speed as what you compressed the spring. You can see the cycle times for compression and release by doing one of the "Time" reports.

Also, data recording stops automatically when the program sees the tester return to approximately the starting position of the press, not when the force goes to zero. That's because you may not have zeroed out for force sensor before the test.

**Be sure to follow safety precautions including wearing safety goggles when operating the spring tester.**

When taking a reading, the Spring Tester takes readings at a faster rate to produce an accurate, repeatable curve of force and spring height/compression.

When the spring tester returns to its starting position, data recording will stop and results will be calculated from the recorded data. If recording does not stop, you can press the <F2> key or click on 'Stop Recording'. If the data looks questionable to the program's analysis, an error message will be given and you may choose to test that spring again.

When done taking a reading, the data is written to the Test Data grid/Test Summary graph on the Main Screen, and the results on this screen are updated.

If you have chosen the appropriate Preference setting, the program will automatically move to the next spring to be tested. This may not give you a chance to see the results for that spring, but does save time. Otherwise, you would review the results, and just press <F9> to advance to the next spring.

# Menu Commands

## Close

Click this option to close this menu and return to the Main Screen.

## Record (F1)

Click this option or press the <F1> key to start recording data. Once you press this, compress the spring and then release the spring. Recording will automatically stop when you return the spring tester handle to approximately its starting location. If recording does not automatically start, press <F2>. See Stop Recording below.

## Stop Recording (F2)

Click this option or press the <F2> key to stop recording data. Normally, recording stops when you return the spring tester to its starting position. If this does not happen for some reason, use this option.

## Options

### Print

Click on this to print the current screen.

### Print Setup

Click on this to bring up the Windows Printer Setup screen to choose various printer options.

### Manually Save Screen Dimensions

If you adjust the size and location of this screen, and the program is not “remembering” the size and location, click on this option to force the program to save these specs.

### Readings for Debugging

Use this option only if directed to do so by a Performance Trends technician.

## Re-Zero Force Readings

Electronics are prone to minor changes (or drift) over time or through temperature changes, etc. This is most obvious when you have no spring on the tester, but the updating force reading is not reading ***exactly*** 0.0. Rather than doing a complete calibration of the system, you can simply re-zero the force reading by clicking on this option. The program will tell you to remove the spring and wait for the force sensor to stabilize. Then click a button and the program will reset the zero force reading.

Note: Because the force sensor is so sensitive, the updating display will never read a constant 0 when there is no spring. However, when force is correctly zeroed, you should see about the same amount of negative readings as positive readings.

Before re-zeroing, you should try to press lightly on the tester platform to see if there is any "stiction" causing hang up in the testers force sensor. If pressing and releasing always brings up a completely different reading, there would be appear to be some type of "hang-up" in the force sensor.

## Eliminate Re-Zero Correction

Click on this option if you want to eliminate any Re-Zeroing effect on the Force sensor. The program will now convert voltage from the electronics exactly as you originally calibrated it.

## Display ...

These "Display" commands are of little value to the user. There are used primarily by Performance Trends technicians to troubleshoot communications problems.

## Force Gauge Scale

Click on this to select the range for the force gauge, either 0-600 lbs, 0-900 lbs or 0-1200 lbs.

## Maximum Spring Height

Click on this to enter the highest spring height that will be displayed on the Height Bar Graph.

## Minimum Spring Height

Click on this to enter the lowest spring height that will be displayed on the Height Bar Graph.

# Help

Brings up "on screen" help.

**IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

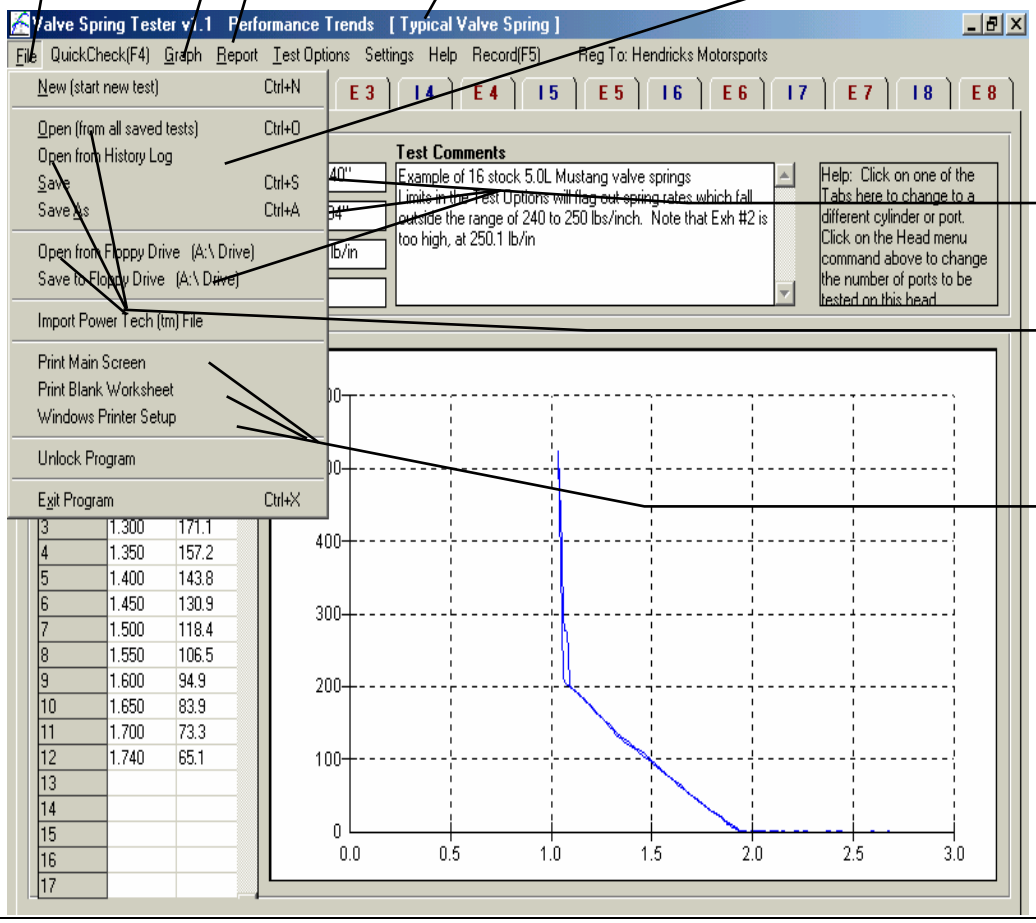
# Chapter 3 Output

The Valve Spring Tester provides several ways to view and output the test results for a complete test, including:

- Reports of tabular data displayed on the screen
- ASCII files for importing results to other software packages
- High resolution graphs
- Printer output of reports or graphs
- History Log (chronological list of test most currently worked with)
- Data Libraries for recording flow test data (or sets of Test Options) for later use.

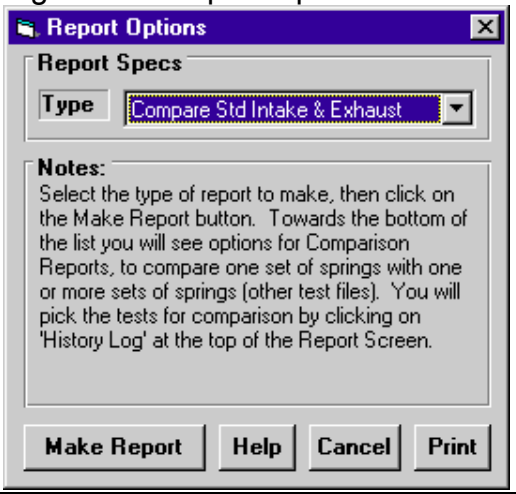
All these topics will be covered in this chapter. Figure 3.1 shows how to reach all these various features.

Figure 3.1 Various Output Options from the Test Results Screen



# 3.1 Reports

Figure 3.2 Report Options Menu




Click on the Report menu command at the Main Screen to be presented with the Report Options Menu shown in Figure 3.2. The inputs in this menu are described below.

## Type

Several types of reports can be picked by clicking on the down arrow key of this combo box. Reports can be for Intake and Exhaust springs, just Intake Springs, or just Exhaust Springs. Report Types basically fall into 4 categories:

1. Std (standard) report, which includes the Data Types of: Spring Rate, Open Force, Open Height, Seated Force, Seated Height, Non Linear %, Bind Height, Clearance and Ht for Force for each spring.
2. Time report, which includes the Data Types of: Spring Rate, Open Force, Seated Force, Bind Height, Clearance, Open Vel, Close Vel, Cycle Time for each spring.
3. Comparison Std (standard) Reports showing side by side comparisons of data included in a Std Report for 2 or more tests. You can also choose Comparison Std + Difference which will include the difference between the 'Baseline' test (the current test) and those you included in the comparison. You choose which tests to include in the comparison by clicking on History Log at the top of the screen and putting a 'Yes in the 'Report?' column.
4. Force vs Height Details showing the Spring Force at various spring heights for all springs side by side.

If you have selected that the intake and exhaust springs are to use the same specs in Test Options, then intake and exhaust springs are listed together. Otherwise, the intake springs are listed first and the exhaust springs are listed second.

## Definitions of Data Types:

**Spring Rate** is the increase in force obtained for each unit of spring compression (inch for English units). This is the rate measured between the Seated Height and the Open Height. Since springs may not be linear, if you change these heights, the spring rate may change.

**Open Force** is the force measured at the Open Height.

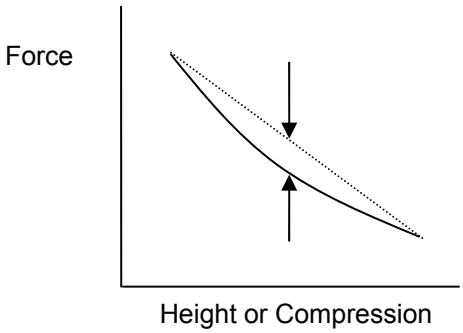
**Open Height** is the height entered in the Test Options screen for spring height when the valve is at maximum lift, or fully open.

**Seated Force** is the force measured at the Seated Height.

**Seated Height** is the height entered in the Test Options screen for spring height when the valve is closed, setting on the valve seat.

**Non Linearity %** is the amount of "bend" in the spring graph of force versus compression (or height). To determine Non Linearity, draw a straight line on the graph from the Open Height point and the Seated Height point. Now, measure the difference between this straight line and the actual force line at a spring height/compression half way between Open and Seated height. See Figure 3.3.

Figure 3.3 Non Linearity



**Bind Height** is the spring height at which coil bind occurs, the spring is completely collapsed and can not be compressed any farther.

**Clearance** is the height/compression difference between Bind Height and Open Height.

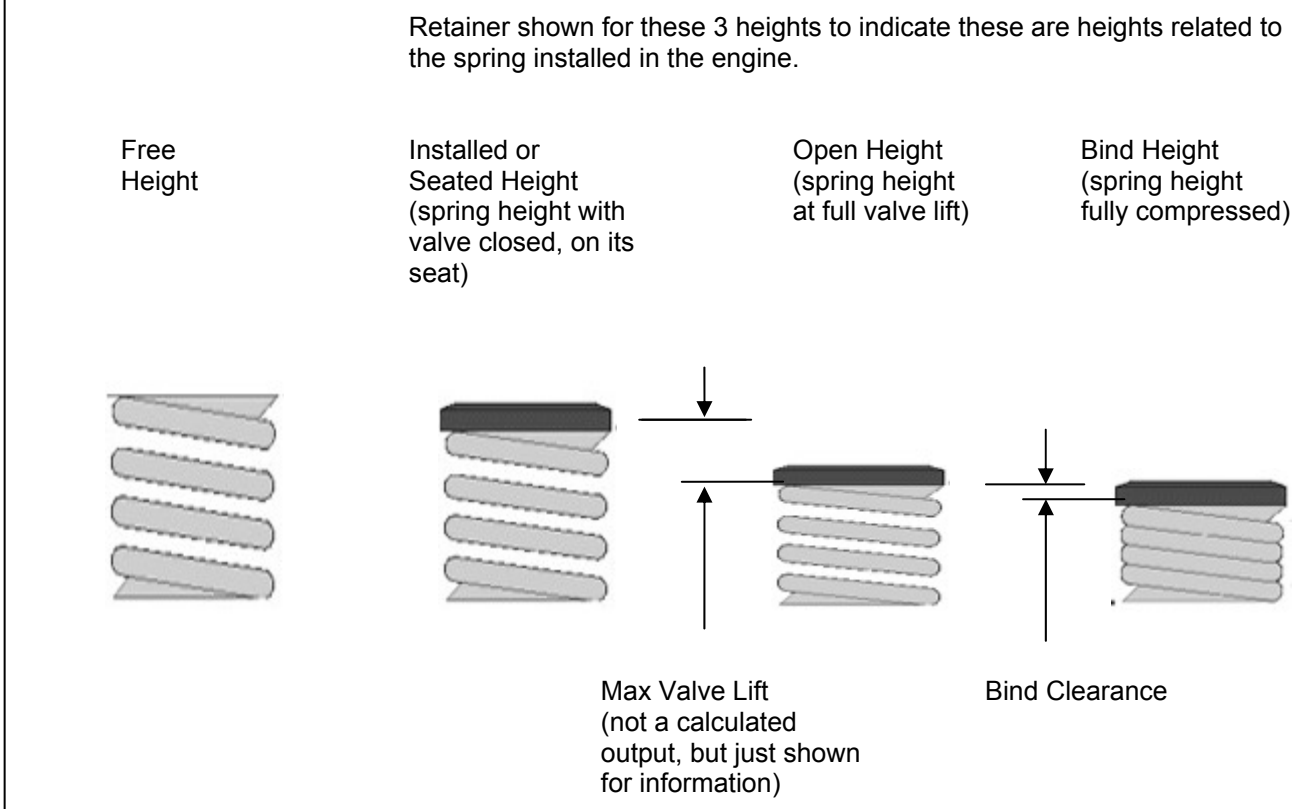
**Ht for Force** is the force that is produced at a particular spring height that you can specify in the Test Options screen.

**Open Velocity** is rate in feet/second at which the operator compressed the spring during the test.

**Close Velocity** is rate in feet/second at which the operator released the spring during the test.

**Cycle Time** is the total time in seconds from start to finish of cycling the spring during the test.

Figure 3.4 Definitions of Various Spring Heights

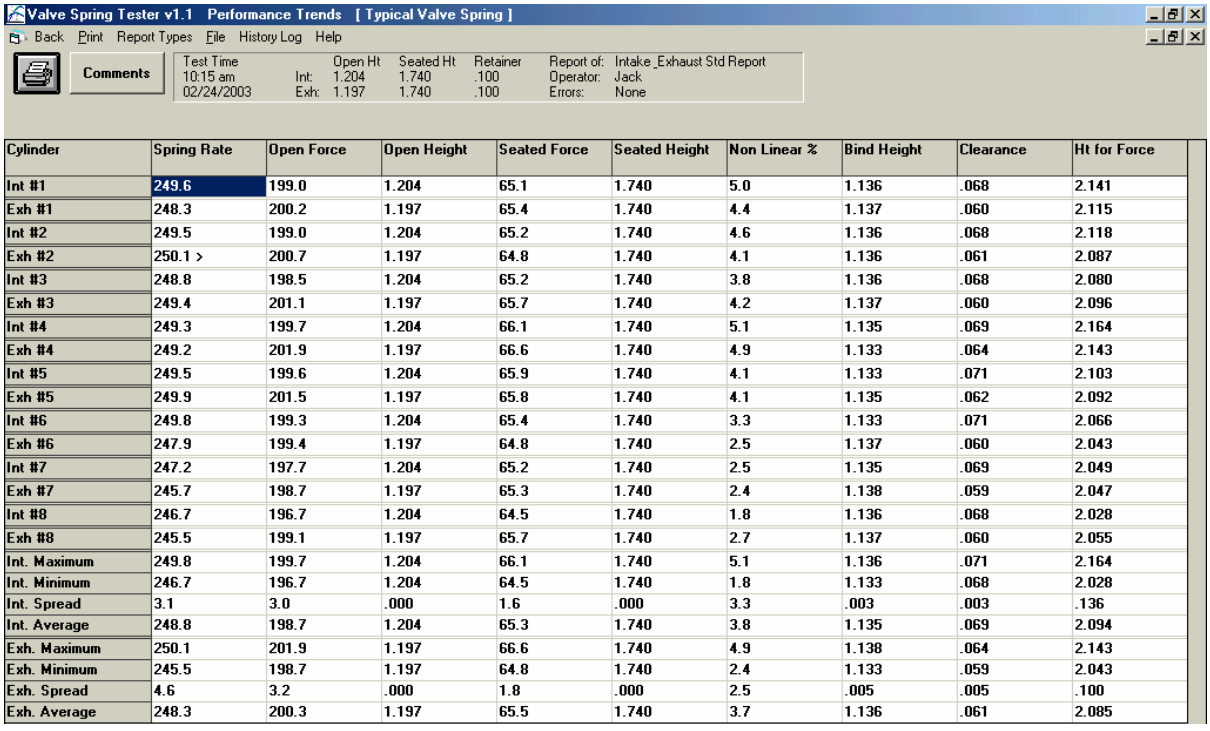


Notes:

If you have selected the Spring Height Format of 'Compression from Seated Ht' (not 'Free Spring Height') on the main screen, then Open Height, Seated Height and Bind Height are reported as heights measured from Seated Height, and the more the spring is compressed, the higher the compression number.

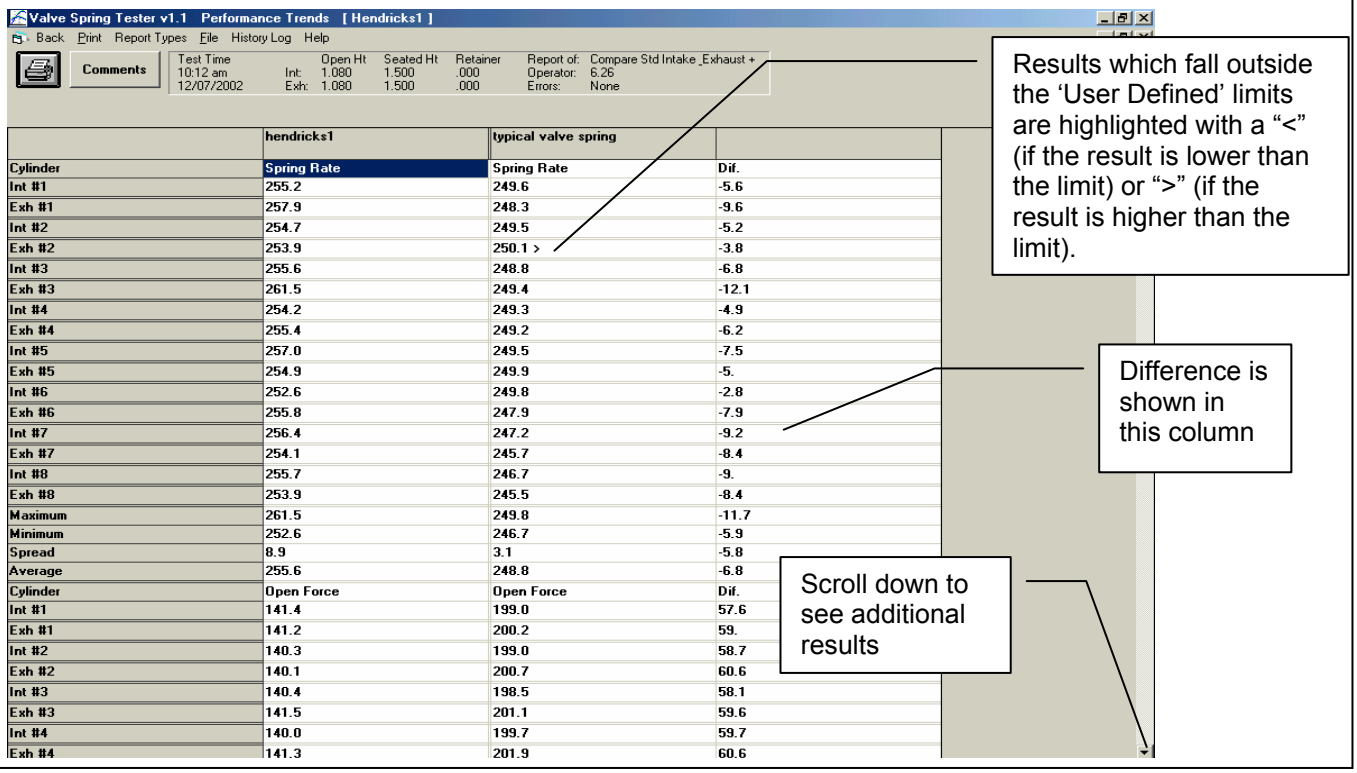
These velocities and times should not have a significant effect on the results. However, if an operator is doing the test very quickly, for example, the electronics may not be able to record enough data for accurate results. Therefore, these velocities and times are used to help determine how different human operators may be producing different results.

Figure 3.5 Standard Intake and Exhaust Report for 1 Set of Springs



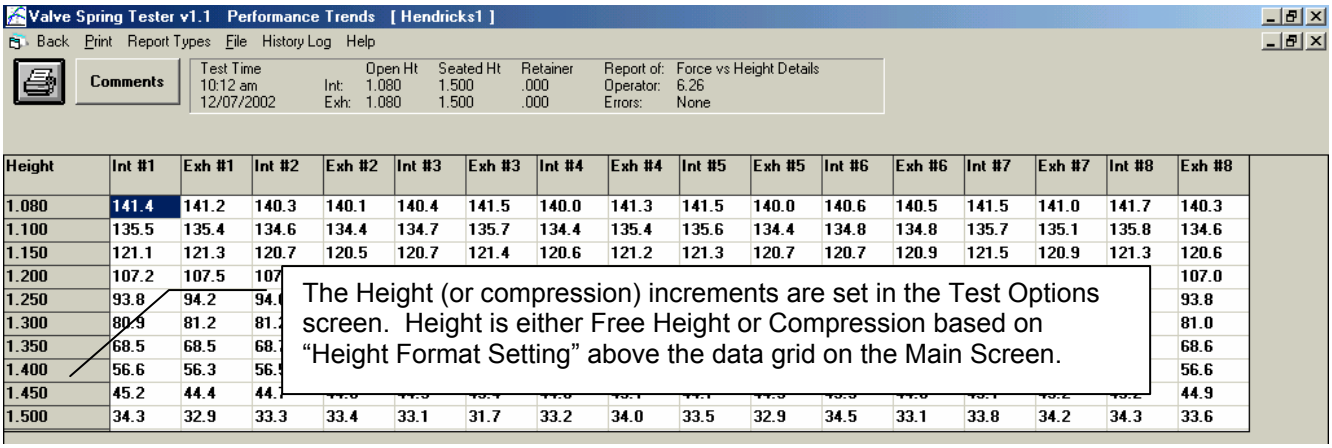

| Cylinder | Spring Rate | Open Force | Open Height | Seated Force | Seated Height | Non Linear % | Bind Height | Clearance | Ht for Force |
|---|---|---|---|---|---|---|---|---|---|
| Int #1 | 249.6 | 199.0 | 1.204 | 65.1 | 1.740 | 5.0 | 1.136 | .068 | 2.141 |
| Exh #1 | 248.3 | 200.2 | 1.197 | 65.4 | 1.740 | 4.4 | 1.137 | .060 | 2.115 |
| Int #2 | 249.5 | 199.0 | 1.204 | 65.2 | 1.740 | 4.6 | 1.136 | .068 | 2.118 |
| Exh #2 | 250.1 > | 200.7 | 1.197 | 64.8 | 1.740 | 4.1 | 1.136 | .061 | 2.087 |
| Int #3 | 248.8 | 198.5 | 1.204 | 65.2 | 1.740 | 3.8 | 1.136 | .068 | 2.080 |
| Exh #3 | 249.4 | 201.1 | 1.197 | 65.7 | 1.740 | 4.2 | 1.137 | .060 | 2.096 |
| Int #4 | 249.3 | 199.7 | 1.204 | 66.1 | 1.740 | 5.1 | 1.135 | .069 | 2.164 |
| Exh #4 | 249.2 | 201.9 | 1.197 | 66.6 | 1.740 | 4.9 | 1.133 | .064 | 2.143 |
| Int #5 | 249.5 | 199.6 | 1.204 | 65.9 | 1.740 | 4.1 | 1.133 | .071 | 2.103 |
| Exh #5 | 249.9 | 201.5 | 1.197 | 65.8 | 1.740 | 4.1 | 1.135 | .062 | 2.092 |
| Int #6 | 249.8 | 199.3 | 1.204 | 65.4 | 1.740 | 3.3 | 1.133 | .071 | 2.066 |
| Exh #6 | 247.9 | 199.4 | 1.197 | 64.8 | 1.740 | 2.5 | 1.137 | .060 | 2.043 |
| Int #7 | 247.2 | 197.7 | 1.204 | 65.2 | 1.740 | 2.5 | 1.135 | .069 | 2.049 |
| Exh #7 | 245.7 | 198.7 | 1.197 | 65.3 | 1.740 | 2.4 | 1.138 | .059 | 2.047 |
| Int #8 | 246.7 | 196.7 | 1.204 | 64.5 | 1.740 | 1.8 | 1.136 | .068 | 2.028 |
| Exh #8 | 245.5 | 199.1 | 1.197 | 65.7 | 1.740 | 2.7 | 1.137 | .060 | 2.055 |
| Int. Maximum | 249.8 | 199.7 | 1.204 | 66.1 | 1.740 | 5.1 | 1.136 | .071 | 2.164 |
| Int. Minimum | 246.7 | 196.7 | 1.204 | 64.5 | 1.740 | 1.8 | 1.133 | .068 | 2.028 |
| Int. Spread | 3.1 | 3.0 | .000 | 1.6 | .000 | 3.3 | .003 | .003 | .136 |
| Int. Average | 248.8 | 198.7 | 1.204 | 65.3 | 1.740 | 3.8 | 1.135 | .069 | 2.094 |
| Exh. Maximum | 250.1 | 201.9 | 1.197 | 66.6 | 1.740 | 4.9 | 1.138 | .064 | 2.143 |
| Exh. Minimum | 245.5 | 198.7 | 1.197 | 64.8 | 1.740 | 2.4 | 1.133 | .059 | 2.043 |
| Exh. Spread | 4.6 | 3.2 | .000 | 1.8 | .000 | 2.5 | .005 | .005 | .100 |
| Exh. Average | 248.3 | 200.3 | 1.197 | 65.5 | 1.740 | 3.7 | 1.136 | .061 | 2.085 |

Figure 3.6 Comparison Report of 2 Sets of Springs (comparison of up to 6 sets possible)




| | hendricks1 | typical valve spring | |
|---|---|---|---|
| Cylinder | Spring Rate | Spring Rate | Dif. |
| Int #1 | 255.2 | 249.6 | -5.6 |
| Exh #1 | 257.9 | 248.3 | -9.6 |
| Int #2 | 254.7 | 249.5 | -5.2 |
| Exh #2 | 253.9 | 250.1 > | -3.8 |
| Int #3 | 255.6 | 248.8 | -6.8 |
| Exh #3 | 261.5 | 249.4 | -12.1 |
| Int #4 | 254.2 | 249.3 | -4.9 |
| Exh #4 | 255.4 | 249.2 | -6.2 |
| Int #5 | 257.0 | 249.5 | -7.5 |
| Exh #5 | 254.9 | 249.9 | -5. |
| Int #6 | 252.6 | 249.8 | -2.8 |
| Exh #6 | 255.8 | 247.9 | -7.9 |
| Int #7 | 256.4 | 247.2 | -9.2 |
| Exh #7 | 254.1 | 245.7 | -8.4 |
| Int #8 | 255.7 | 246.7 | -9. |
| Exh #8 | 253.9 | 245.5 | -8.4 |
| Maximum | 261.5 | 249.8 | -11.7 |
| Minimum | 252.6 | 246.7 | -5.9 |
| Spread | 8.9 | 3.1 | -5.8 |
| Average | 255.6 | 248.8 | -6.8 |
| Cylinder | Open Force | Open Force | Dif. |
| Int #1 | 141.4 | 199.0 | 57.6 |
| Exh #1 | 141.2 | 200.2 | 59. |
| Int #2 | 140.3 | 199.0 | 58.7 |
| Exh #2 | 140.1 | 200.7 | 60.6 |
| Int #3 | 140.4 | 198.5 | 58.1 |
| Exh #3 | 141.5 | 201.1 | 59.6 |
| Int #4 | 140.0 | 199.7 | 59.7 |
| Exh #4 | 141.3 | 201.9 | 60.6 |

Figure 3.7 Force vs Height Details Report (showing results for each spring)




| Height | Int #1 | Exh #1 | Int #2 | Exh #2 | Int #3 | Exh #3 | Int #4 | Exh #4 | Int #5 | Exh #5 | Int #6 | Exh #6 | Int #7 | Exh #7 | Int #8 | Exh #8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.080 | 141.4 | 141.2 | 140.3 | 140.1 | 140.4 | 141.5 | 140.0 | 141.3 | 141.5 | 140.0 | 140.6 | 140.5 | 141.5 | 141.0 | 141.7 | 140.3 |
| 1.100 | 135.5 | 135.4 | 134.6 | 134.4 | 134.7 | 135.7 | 134.4 | 135.4 | 135.6 | 134.4 | 134.8 | 134.8 | 135.7 | 135.1 | 135.8 | 134.6 |
| 1.150 | 121.1 | 121.3 | 120.7 | 120.5 | 120.7 | 121.4 | 120.6 | 121.2 | 121.3 | 120.7 | 120.7 | 120.9 | 121.5 | 120.9 | 121.3 | 120.6 |
| 1.200 | 107.2 | 107.5 | 107 | | | | | | | | | | | | | 107.0 |
| 1.250 | 93.8 | 94.2 | 94. | | | | | | | | | | | | | 93.8 |
| 1.300 | 80.9 | 81.2 | 81. | | | | | | | | | | | | | 81.0 |
| 1.350 | 68.5 | 68.5 | 68. | | | | | | | | | | | | | 68.6 |
| 1.400 | 56.6 | 56.3 | 56. | | | | | | | | | | | | | 56.6 |
| 1.450 | 45.2 | 44.4 | 44. | | | | | | | | | | | | | 44.9 |
| 1.500 | 34.3 | 32.9 | 33.3 | 33.4 | 33.1 | 31.7 | 33.2 | 34.0 | 33.5 | 32.9 | 34.5 | 33.1 | 33.8 | 34.2 | 34.3 | 33.6 |

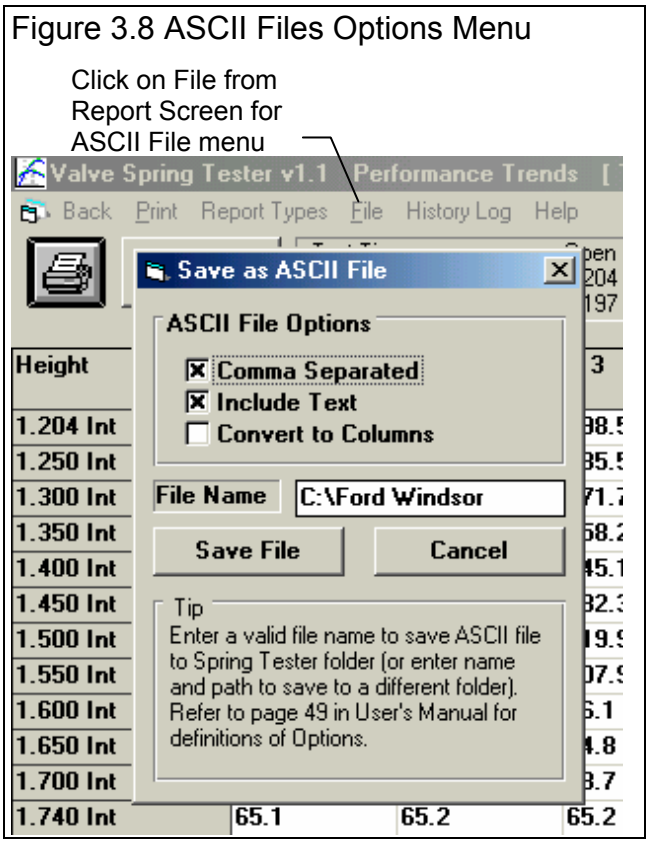
**IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

# 3.2 ASCII Data Files

You may want to use the results from the Spring Tester in other software packages. This could be for additional graph capabilities, statistical analysis, data basing, etc. Once you have created a report (as shown in Section 3.1), click on File to write the results to an ASCII file with a name of your choosing. The ASCII File command is possible any time a report is displayed on the screen.

You can only save the results currently displayed on the Report screen. If you want to write an ASCII file of a test file you have previously run, you must open that test file first, then create a report for that test file (unless you create a comparison report of the current file with this previously run file).

Figure 3.8 ASCII Files Options Menu




## ASCII File Options

## Comma Separated

Select this option to insert commas between data points. Leave this unchecked for data to be arranged in evenly spaced columns.

## Include Text

Select this option to strip out all titles and letters, leaving only numbers.

## Convert to Columns

If you do not select this option, data will be written to the file much like it is displayed in the report on the screen. Select this option to have the report turned on its side, that is, the rows will become columns and the columns will become rows.

## File Name

Enter a file name for saving this ASCII file. Checks are made to ensure what you enter is a valid file name and that you are not overwriting an existing file. The file is written to the Valve Spring Tester Analyzer folder (directory), the folder which contains the Spring-V.exe program file.

There are certain limitations for file names, including:

- Names can only be 40 characters long.
- Names can not contain certain characters, like question mark (?), slash (/), etc. The program will warn you if you use an illegal character.

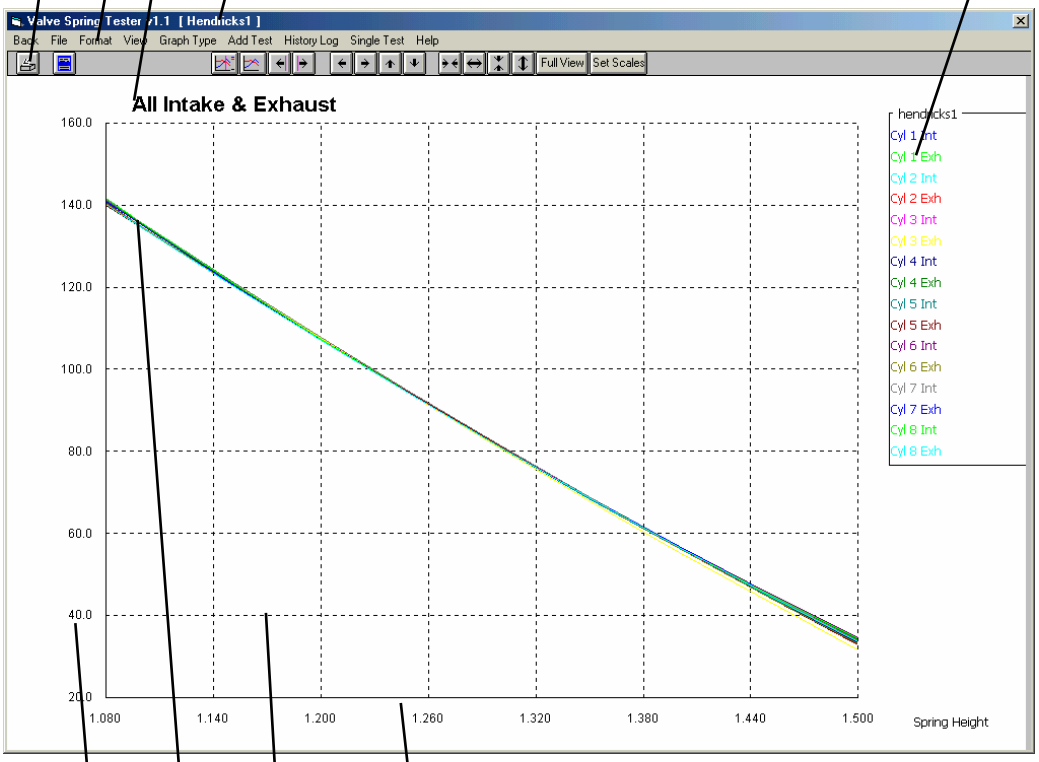
See Section 3.6 for more details on file names

**IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

# 3.4 Graphs

Graphs are obtained by clicking on the Graph menu command at the top of the Main Screen or clicking on the Summary Graph at the Main Screen. Figure 3.18 shows a typical graph and a descriptions of some of the basic graph screen items.

Figure 3.9 Primary Graph Screen Items




Command buttons. Some commands can only be done through these buttons, some of these buttons just provide a graphical button for performing action of some menu items.

Menu bar provides for several graph commands and options.

Graph Title, which can be changed by clicking on Format, then Edit Titles/Legend

Name of current Test File containing all spring data and specs

Graph Legend, which describes the data graphed. This includes Name of the Test Results file, Type of Data, which data goes with which file, if any multiplier is applied to the data. You can also click on Data Type names and the corresponding data line will flash. This is useful to find a particular line when several are graphed. The names in the Legend can be changed by clicking on Format, then Edit Titles/Legend.

Horizontal X axis. The scaling of this axis can be easily changed as described in this section.

Grid lines. The style or elimination of grid lines can be changed by clicking on Format, then Grid Style.

Data graph lines. The style and thickness of these lines can be changed by clicking on Format, then Line Style. Bar Graphs also possible for certain graph types.

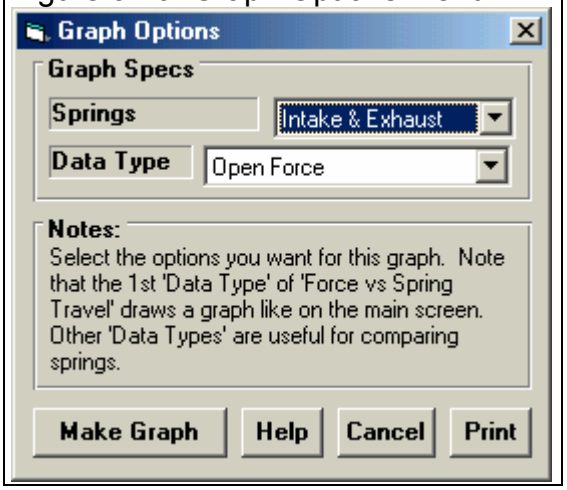
Vertical Y axis. The scaling of this axis can be easily changed as described in this section.

There are 2 basic types of graphs which can be made:

- Spring Force vs either Spring Height or Spring Compression. Which is used for the X axis is set with the Spring Height Format setting above the data grid on the Main Screen.
- Results (like Spring Rate, Open Force, etc) for the various springs compared to each other.

You determine which type of data you graph by the Graph Type in the Graph Options menu. See Figure 3.10.

Figure 3.10 Graph Options Menu




## Springs

Here you can select to graph just the intake springs, just the exhaust springs or both the intake and exhaust springs together.

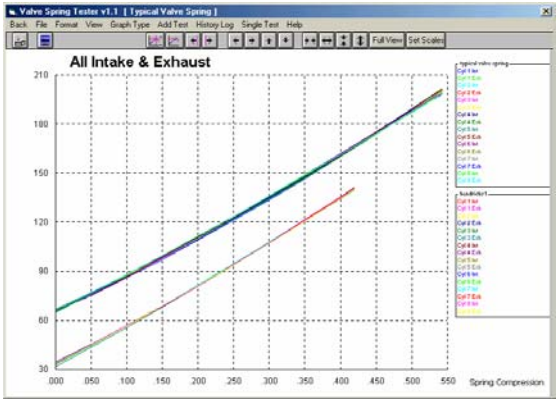
## Data Type

You can choose from the following Data Types to graph:

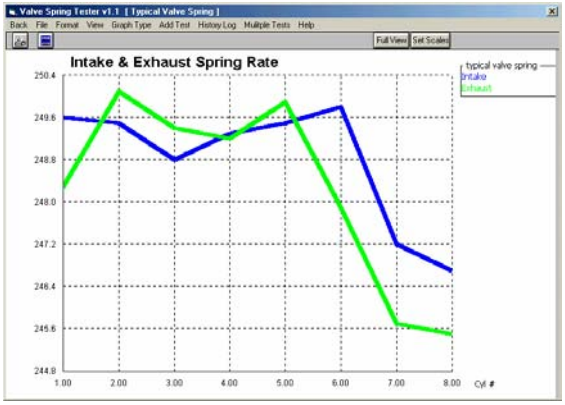
Force vs Spring Travel — This graph shows force for each spring at various heights

| | | |
|---|---|---|
| Spring Rate | Open Force | These graphs show the data type graphed for each spring compared to the other springs |
| Open Spring Height | Seated Force | |
| Seated Spring Height | Non Linearity | |
| Bind Height | Bind Clearance | |
| Test Opening Velocity | Test Closing Velocity | |
| Test Cycle Time | Force at Height | |

Figure 3.11 Comparison of 2 Categories of Data Type Graphs




Force vs Spring Travel




Spring Rate (shown here), Open Force, etc graphed for each individual spring vs Cylinder Number.

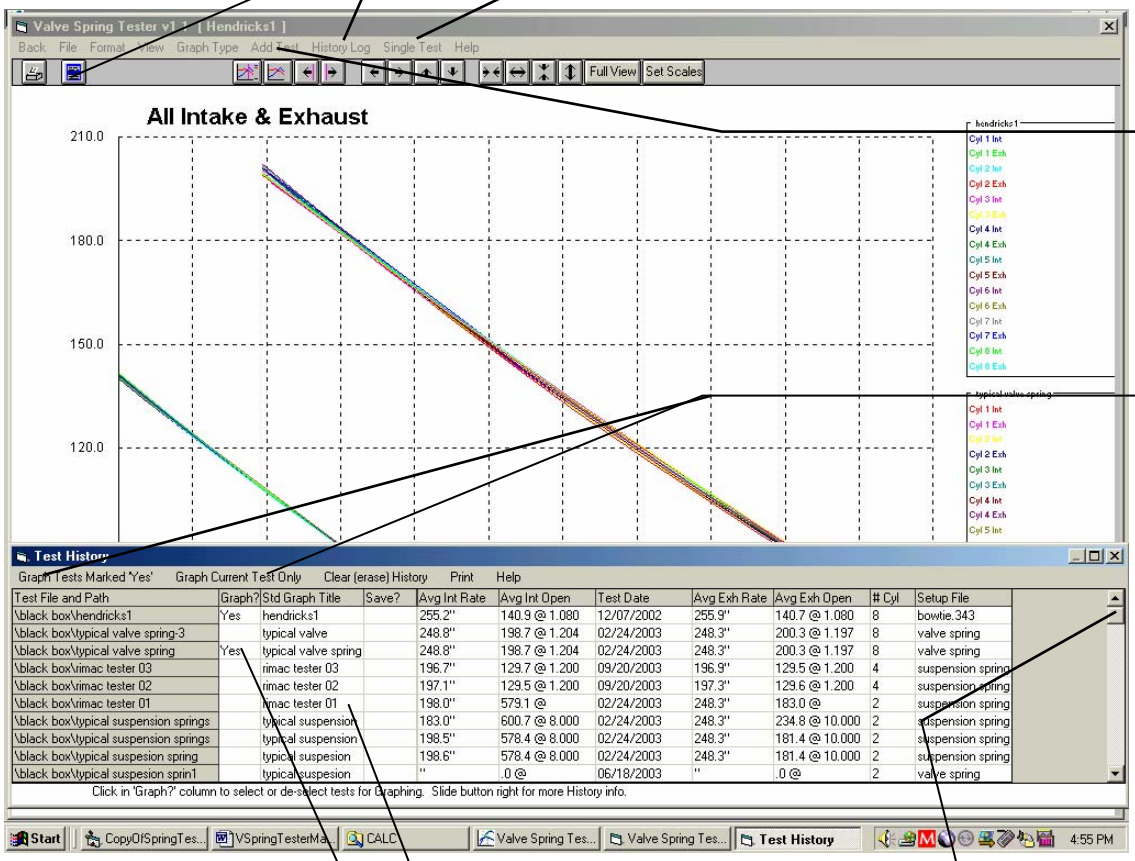
## Graphs Comparing More Than 1 Test

There are 3 ways to pick which tests are graphed:

- ***Current test results***. These are the test results of the test file which you are working with on the Main Screen.
- ***Tests marked in the History Log***. These are the test results which you previously graphed, started new, opened, etc. which you have marked "Yes" to graph in the History Log (see Section 3.8).
- ***Add Test*** lets you pick any test from the Test Library to add to the top of the History Log, and mark as a test you want to graph. Since it is at the top of the History Log, it should definitely be included in the next graph.

You can compare data from up to 6 tests, as long as there is room for the Legends (labels) for each graph on the right side of the graph. Usually this ends up being about 48 graph lines, which could be 6 tests with 4 graph lines (for example, Int only for 4 cylinders), or 3 tests with 8 graph lines (for example, Int & Exh for 4 cylinders), etc.

Figure 3.12 History Log (See Section 3.8 for more details.)



## Other Graphing Features

The graph screen has several other features, including:

- Printing
- Cursor to pinpoint the value of a particular point on the graph
- Changing titles and legend names
- Changing the scales
- Line Type (format)

These are discussed in this next section.

## Printing

Figure 3.13 shows the options for printing graphs and how to access these options. Figure 3.14 shows the screen for changing the Windows Printer Setup. Figure 3.15 shows how you can add information to a graph printout by clicking on Format, then Edit Printed Comments and Data Output.

Figure 3.13 Printing Graphs

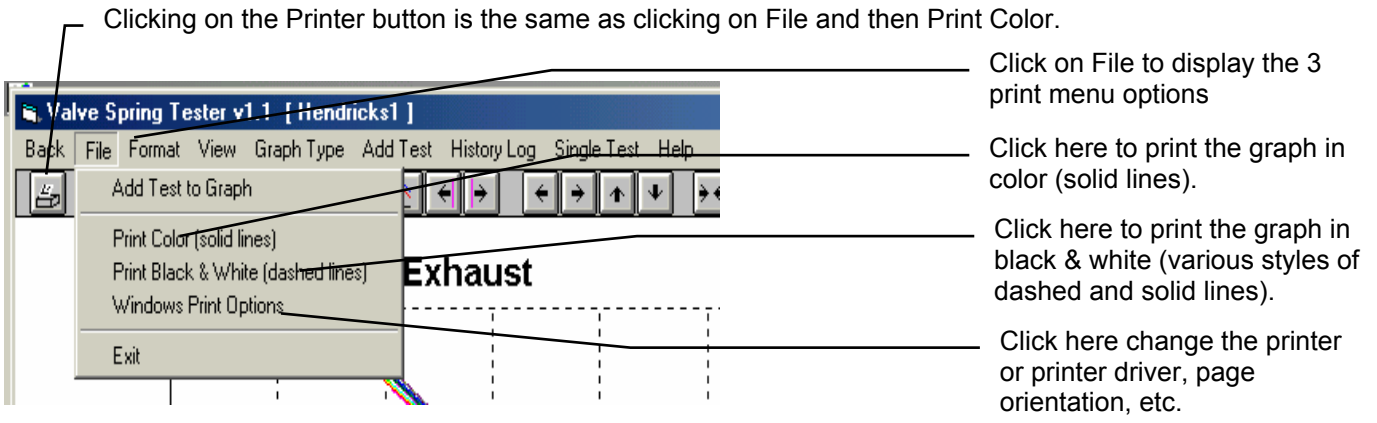



Figure 3.14 Standard Windows Printer Options

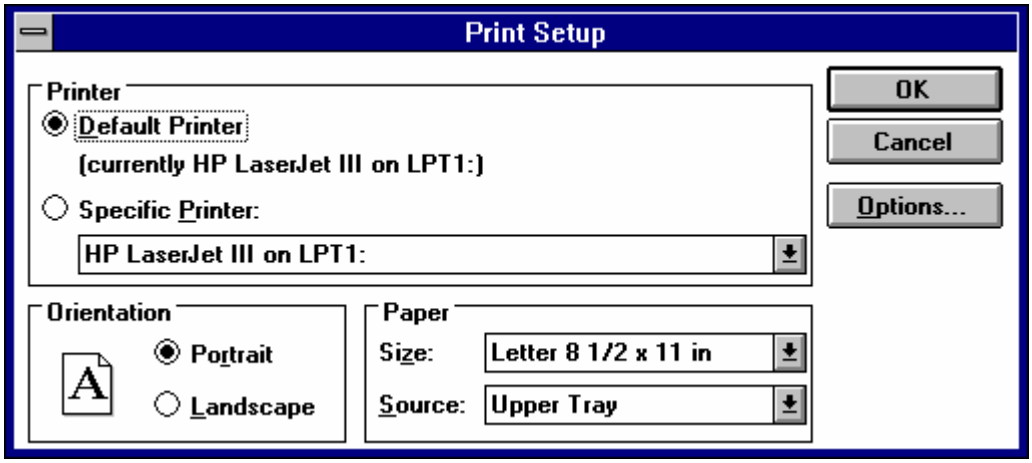
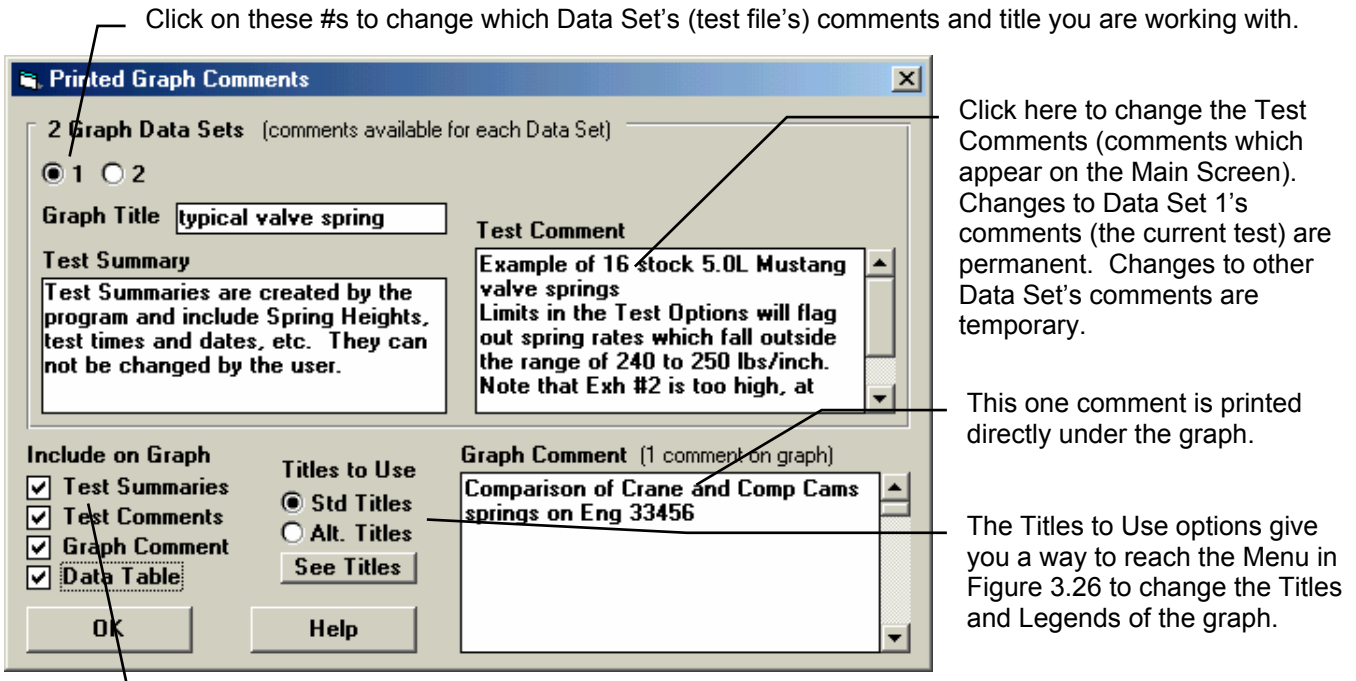
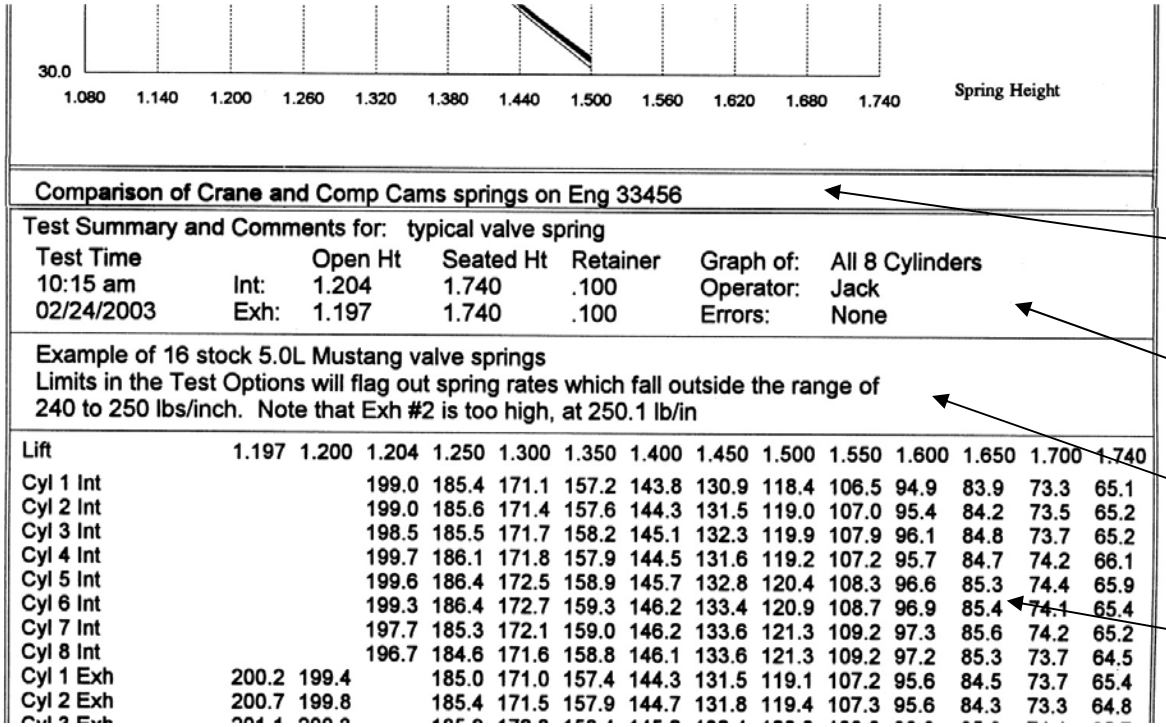


Figure 3.15 Adding Information to a Graph Printout (Most of these options have no effect on the graph on the screen, only the graph that is printed.)

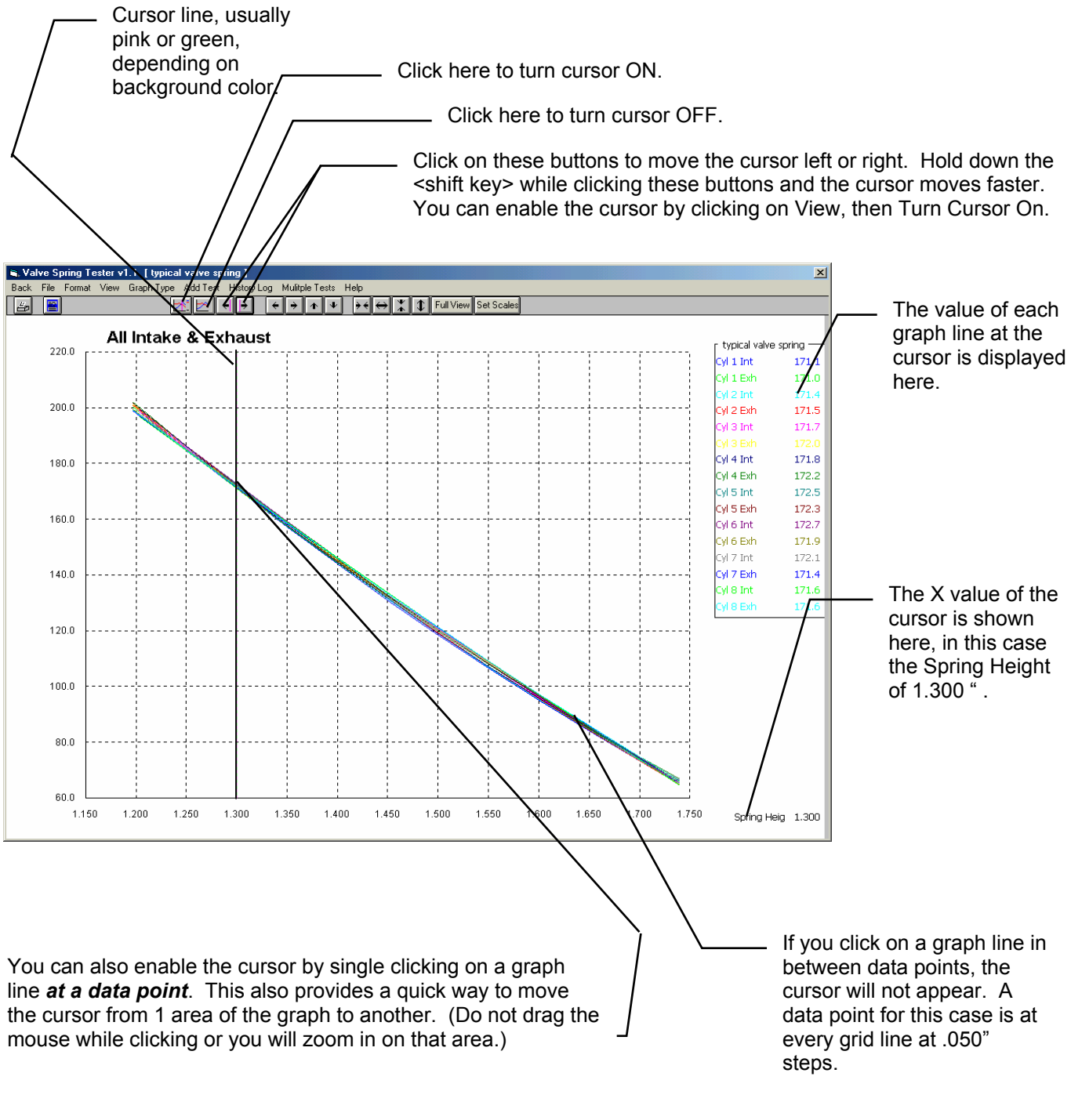


## Cursor

The cursor feature is very useful for determining or comparing the value of the graph lines at various places. See Figure 3.25 for explaining the use of the cursor.

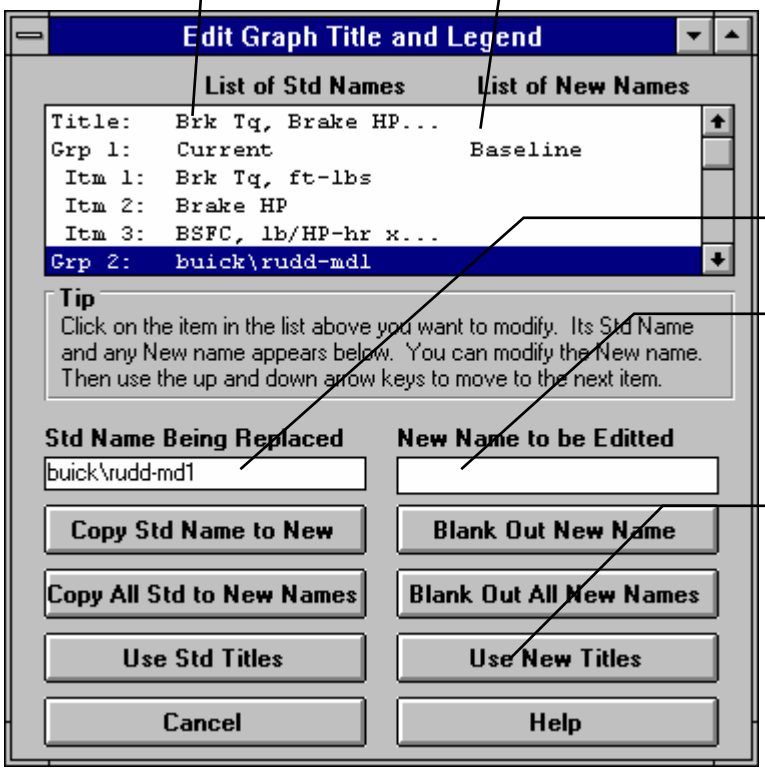
Figure 3.16 Cursor Features and Commands



## Changing titles and legend names

Many times you may want to customize a graph by displaying and printing labels of your choice. Click on Format and then Edit Titles/Legend to bring up the menu shown in Figure 3.17 which will allow you to do this.

Figure 3.17 Menu to Edit Title and Legend




This is the list of Standard names the program uses unless you click on the Use New Titles button below. Select (click on) a Standard name you want to change. The Standard Name appears in the edit box, along with the current New name if there is one. ***Once you have selected a name from this list (that row will be highlighted) it is easier to use the up and down arrow keys to select the next item to edit than clicking the item with the mouse.***

This is the list of New names the program will use if you click on Use New Titles. If a title in the List of New Names is blank, the program will use the Standard name.

Standard name from row selected.

New name for you to edit. Other options include clicking on the Copy Std Name to New or Blank Out New Name buttons.

Click here to close this menu and use the New names you have entered. Where New names have been left blank, the Standard name will be used.

**IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

## Changing the scales

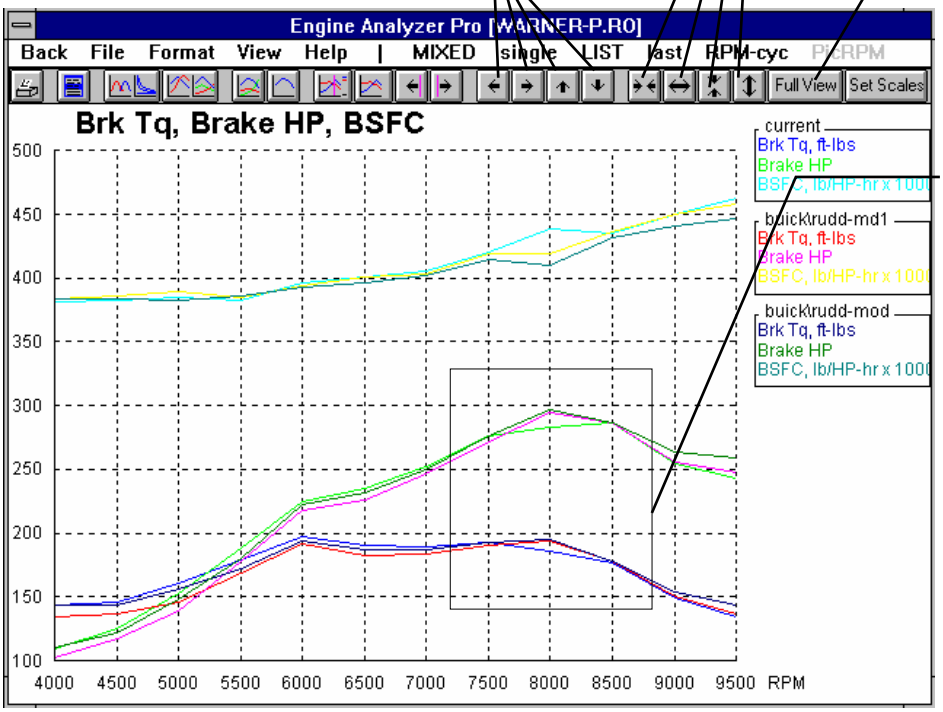
Many times you may want to change the scale of the X or Y axis. This may be to show an area in more detail or to match the scales of a previous graph. The Pro has several ways to change the scales as shown in Figures 3.18 and 3.19.

### Figure 3.18 Changing Scales for the X or Y Axis

Clicking on these buttons shifts the graph left, right, up or down. Hold down the shift key while clicking on them and the graph moves farther each step.

Clicking on these buttons zooms in or zooms out on the graph, either vertically or horizontally Hold down the shift key while clicking on them and the graph moves farther each step.

Click here to restore "auto-scaling". That is where the computer picks the scale to show all the graph in good detail.

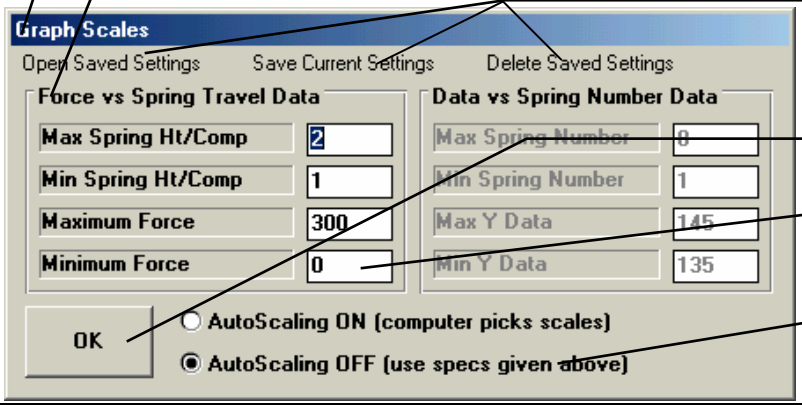



You can use the mouse to outline an area to be zoomed in on. Simply click on the mouse key in the upper left corner of the area, then hold the key down and drag the mouse to the lower right corner of the desired area. A box will be drawn as shown. When you release the mouse key, this area will fill the whole graph. This feature is disabled if the cursor is turned on. Also, start the upper left corner well away from a graph line or the program may turn on the cursor instead.

### Figure 3.19 Menu to Specify Graph Axes Scales

This menu can be obtained 2 ways. You can click on View in the menu bar then Specify Scales (axes), or click on the Set Scales button, the right most button on the graph screen.

Depending on the type of graph data you currently working with, one of these 2 sections will be enabled.




You can Save these settings for easy recall later, using the Open Saved Settings, or Delete them from Saved settings with Delete.

Click on OK to have the graph redrawn to these new scale

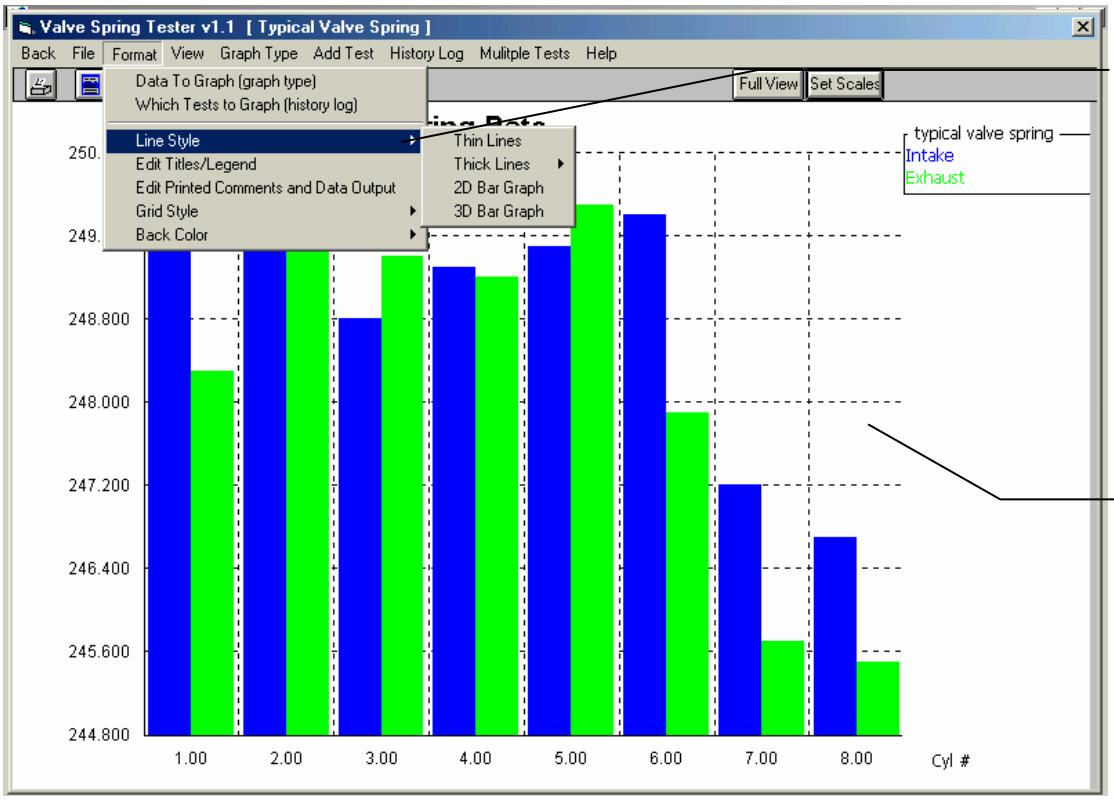
The current scale limits are loaded when this menu opens. Change any or all these to most any value you want.

Click the Turn Autoscaling Off button to turn Autoscaling Off to enable changing specs in this menu.

## Line Type (format)

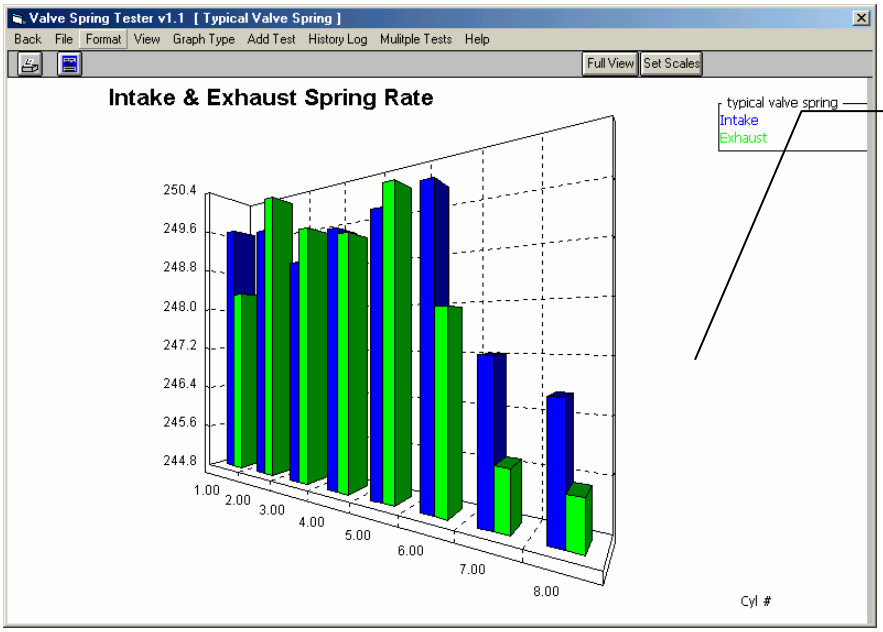
For Spring Force vs Height, only Line Graphs are possible, but with different line thicknesses. For graphing results for individual springs, line graphs are possible and 2D or 3D bar graphs. See Figure 3.20 below.

Figure 3.20 Alternate Line Types for Graphing Results for Individual Springs




Click on Format, then Line Styles and choose from various line thicknesses or 2D or 3D bar graphs.

2D Bar Graph



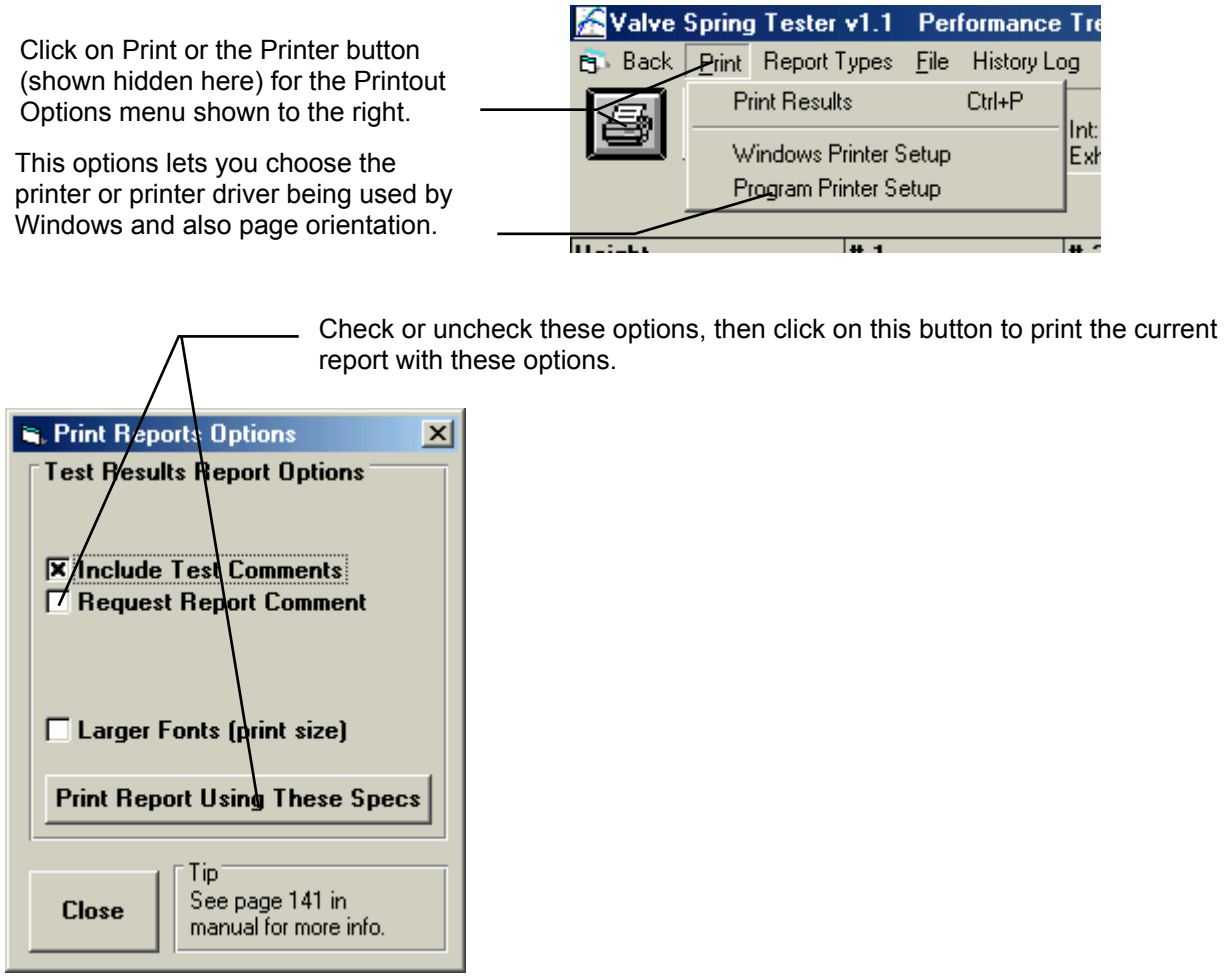

3D Bar Graph of Spring Rate vs Cylinder Number.

Note: These are more complicated for the program to construct. If the graph does not look correct, close it by clicking on Back, the re-create it by clicking on Graph at top of the main screen.

# 3.5 Printer Output

The Valve Spring Tester can print the tabular test results of a report for a permanent hardcopy by clicking on Print in the menu bar or the Printer icon. The menu of options shown in Figure 3.31 will appear. Check the options you want to use for the printout by clicking on any or all of the Option boxes. All options and buttons are discussed in this section.

Figure 3.31 Printer Button and Print Menu Command Options - Report Screen




## Test Results Report Options

## Include Test Comments

Select this option if you want all the comments for the Test File printed with the results.

## Request Report Comment

Select this option if you want to be asked for a comment for each particular report you send to the printer. These "report comments" are useful to identify important points for future reference, like modifications, engine results, etc.

## Larger Font (Print Size)

Check this option if your particular printer is printing the results with a small print font. This option will increase the font size for some parts of some reports. Also see Preferences for Selecting Printer Fonts, page 26.

## Other Print Options

Other menus have print menu commands or print buttons as shown in Figures 3.22 and 3.23.

Figure 3.22 Print Commands under File Options (Pro Version Only)

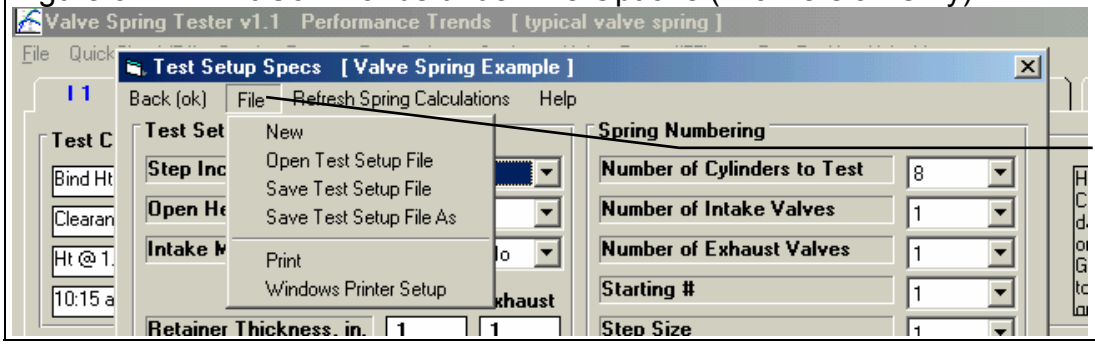
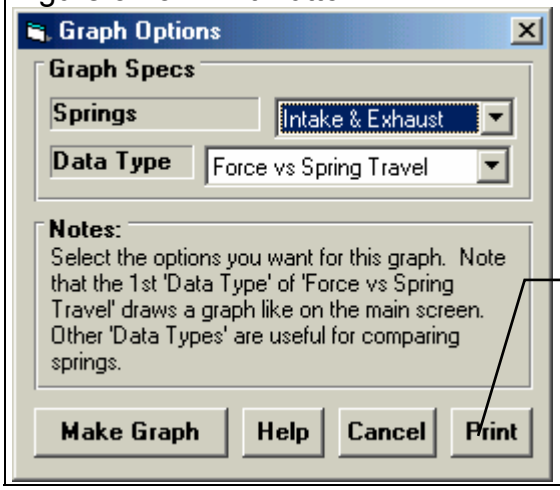


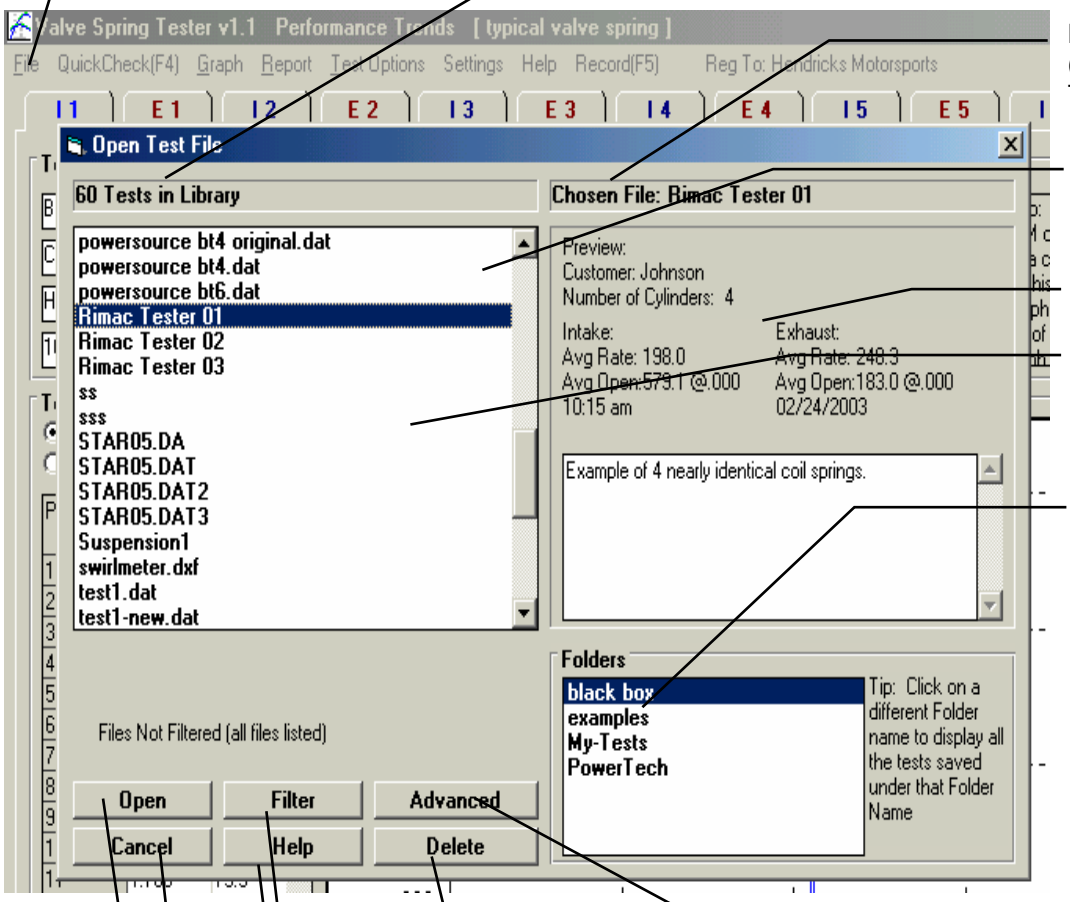

Figure 3.23 Print Button



# 3.6 Data Libraries

The Valve Spring Tester allows you to save a set of Spring Data and related specs (Test Options, etc) to the Test File Library under a name of your choosing. You can then open these test files out of the Test File Library in the future for comparison or modification. The Open window is below with explanations.

Figure 3.24 Test Library Options



## Open a Test File

To open a test file saved in the Test Library, click on File at the upper left corner of the Main Screen, then on the Open (from all saved tests). You also have an additional option of "Open (from History Log)" which will be discussed in Section 3.8.

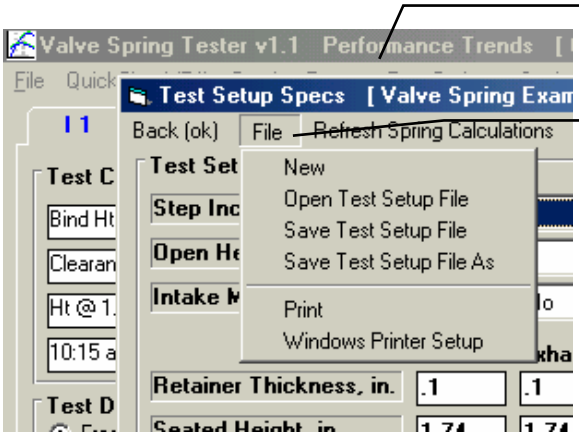
You will obtain the window shown on the previous page. Single click on one of the tests in the list, or click and drag the slide button on the right side of the list to display more tests. Once you single click on a test, it is now the Chosen Test File and a preview of the test is given in the Preview section. If the file you chose was not a valid Valve Spring Tester file, the program will tell you and you can not choose it.

Once a test has been chosen, you can delete it by clicking on the Delete button, or Open it by clicking on the Open button in this window. You can also click on a different test to Preview it or close this window and return to the Main Screen without choosing a new test file.

If you are sure of the test you want to open, you can simply double click on it from the Test List. This opens the test without a preview and closes this menu.

**Note:** You can also save sets of Test Options to its own separate libraries. This is done very similarly as with the Test Files, except you click on File, then Open from the Test Options menu. See Figure 3.25.

Figure 3.25 Test Options




Current Test Options File Name

Click on File in the Test Options menu to Open a set of saved specs, or to save the current set of specs in just that screen. This allows you to build libraries of Test Options for easily creating new tests in the future.

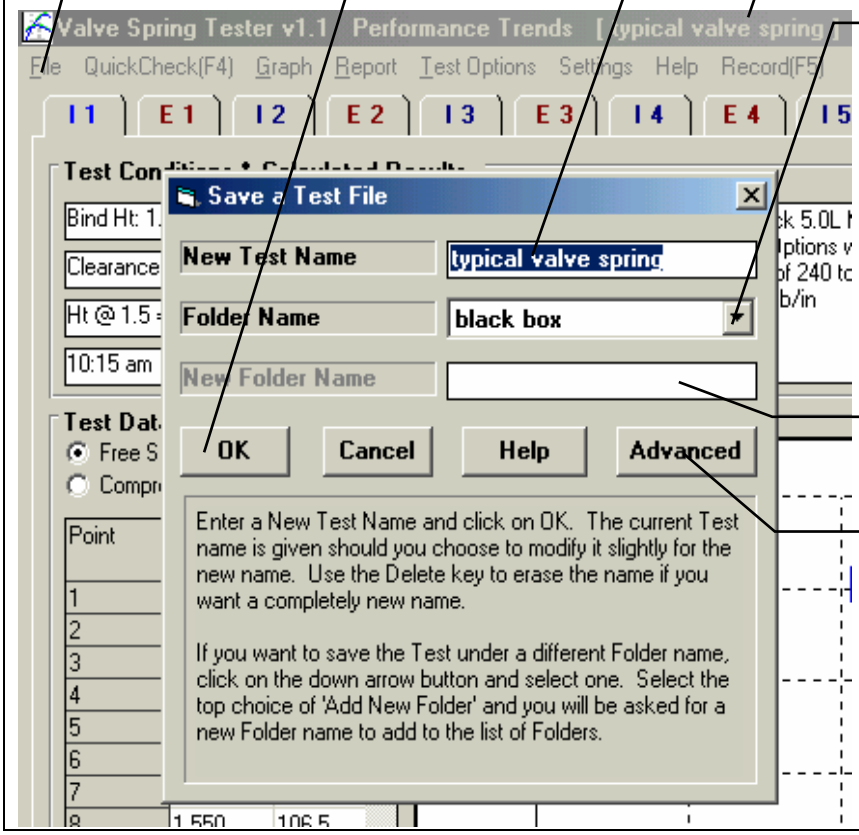
- New blanks out the current specs and comments.
- Open Saved opens a library of specs ***you*** have saved.
- Save saves the current specs to the same name as these specs are currently called.
- Save As saves the current specs to a new name that you will enter.

## Save a Test File

Before you discuss saving a test file, it is important for you to understand how the program opens and uses test files. When you open a test from the Test Library, you are only using a *copy* of the test. The original test file is kept in the library.

As you make changes to the test, they are only made to this copy. The original file is not changed. If you want to delete your changes, you can simply open a fresh, unchanged copy of the original test file from the Library. If you want to keep your changes, *you must save them*. This can be done by clicking on File, then Save. You are also asked if you want to save your changes whenever you open a new test, and the program has detected you have made changes to the current file.

Figure 3.26 Saving Test File Options




To save a Test File, you will be presented with the Save Window as shown above. The program suggests a new test name which is the same as the current test name shown at the top of the Main Screen. If you want to save your changes to the same name, simply click on OK. This will update the current test file with your latest changes.

If you want to save the current set of test specs with your changes to a new name (and leave the current test file in the Library unchanged), then click on the suggested file name and modify it as you want. For example, in the window shown above, you may want to add -2 to the current name "typical valve spring" to create "typical valve spring-2" to indicate this is the 2nd revision of "typical valve spring". This is the safest way to make changes, because you can always return to an earlier version and see what you had done.

Because the Suspension Analyzer is a 32 bit program (not compatible with the older Windows 3.1), it can use most any type of file name. The names can be up to 50 characters long and can include spaces, and upper case and lower case letters. However, there are certain limitations for file names, as they can ***not*** contain certain characters, like / \ : | > < * ? " . The program will warn you if you use an illegal character.

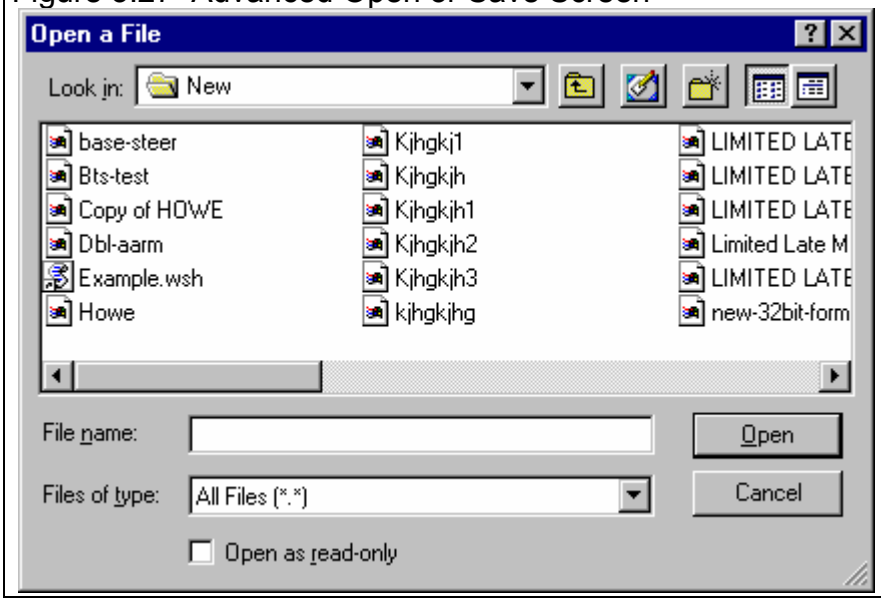
Test files are saved to folders (directories) you have created in the Spring Data folder (directory) in the Spring-V folder (directory) under PERFTRNS.PTI folder (directory). You ***can*** copy Valve Spring Tester files from programs on other computers to this folder (directory) and they will be found by the program. The Save to Floppy and Open From Floppy commands discussed on page 18 are an alternate, perhaps easier way to copy files from one computer to another.

The method of saving Test Options files is exactly the same as complete Test Files, except that you access the Save menu by clicking on File at the top of these individual menus, as shown in Figure 3.25. These files are saved to the Test Options folders (subdirectories).

## Advance Open or Save Screen

If you click on the Advanced button in either the Open or Save As screen, you will obtain the screen shown in Figure 3.27. From here you can access most and file on the computer on most any disk drive.

Figure 3.27 Advanced Open or Save Screen



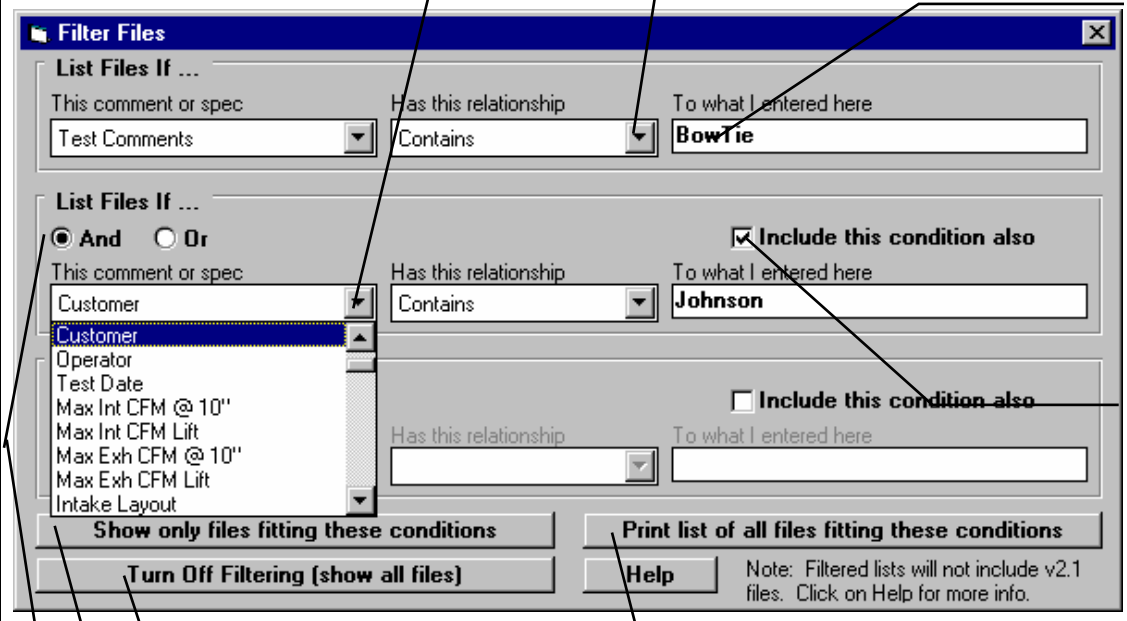

## Tips to Advanced Users:

If you have a file from another computer, from another disk (like a floppy) or folder, you can simply copy it into any folder in the Spring Data folder and it will be found by the Spring Tester program. This can be done with a program like Windows Explorer. You can also create new folders (directories) in the Spring Data folder and these will also be used by the Spring Tester program.

# 3.7 Filter (find) Test Files

The Valve Spring Tester has a powerful way to search for tests in the Test Library called the Filter Option. Click on the Filter button in the Open Test File menu (Figure 3.24, page 67) to be presented with the screen shown in Figure 3.28 below.

Figure 3.28 Filter Files Menu




Click on the down arrow button to pick the spec or comment to check for a certain condition "Has this relationship".

Click on the down arrow button to pick the condition to look for. These change depending on the spec or comment you have chosen.

Type in (or pick from a list for some specs) the condition to look for. The program treats UPPER and lower case letters the same (bowtie = BOWTIE = BowTie).

Check here to include a 2nd condition. This enables specs in this section.

Click here to produce a report of all files meeting the Filter conditions IN ALL FOLDERS in the SpringData folder (the entire Test Library). This way you can avoid looking in each folder separately and can save time.

Click on this button to return to the File Open menu which will now show ***all test files***.

Click on this button to return to the File Open menu which will now ***only show files which fit the Filter Conditions***.

Select And and the Test Files displayed must fit ***both*** conditions specified. Select Or and the Test Files displayed can fit ***either*** of the conditions specified.

- The settings in this screen will display all test files with the word BowTie (or bowtie or BOWTIE) somewhere in the test comments and with the word Johnson (or johnson or JOHNSON) somewhere in the Customer description (a spec in the Test Options menu).

The Filter Feature is very useful for finding a specific test or to find all the tests which meet a certain set of conditions. For example, say you want to find a test that Operator "Jack" ran for Customer "Smith" on "Big Block Chevy" springs. Or, say you are having problems with a certain brand of valve springs, where the part # you record in the comments starts with "NAP". Or perhaps you want to find all Small Block Chevy springs that measured over 400 lbs at Open Height on the exhaust. In all these cases, the filtering specs would allow you to find the test files.

First you must select the condition you want to look for by clicking on the down arrow button on the 'This comment or spec' box. Your choice of this spec will determine what the 'Has this relationship' options are, and what specs can be entered in the 'To what I enter here' spec.

You can select up to 3 conditions to look for. For the Operator “Jack”, Customer “Johnson”, “Big Block Chevy” example above, you would need to search for 3 conditions. For the valve seal example, you could just search for 1 condition (look for “NAP” in the test comments). You add conditions by checking the 'Include this condition also' box. This enables the other specs for each condition.

If more than 1 condition is being used for the search, you must determine if you want the search to include tests which fit ANY of the conditions (Or) or must match ALL conditions (And). For example, if you are looking for tests run by either Operator Jack or Operator Joe, you would select “Or”. If you want Tests which measured more than 400 lbs at the Open Height on Exhaust ***and*** were done since Jan 1999 (the tests must match both conditions), you would select “And”.

The 3 command buttons will do the following:

Show Files Only Fitting These Conditions will return you to the Open Test File screen. Only files fitting these conditions will be displayed (which may be no files in some situations). You can click on various folders (or whatever name you have given to folders in the Preferences menu at the Main Screen) to see if there are any matches in other folders.

Turn Off Filtering (show all files) will return you to the Open Test File screen and now all files will be displayed.

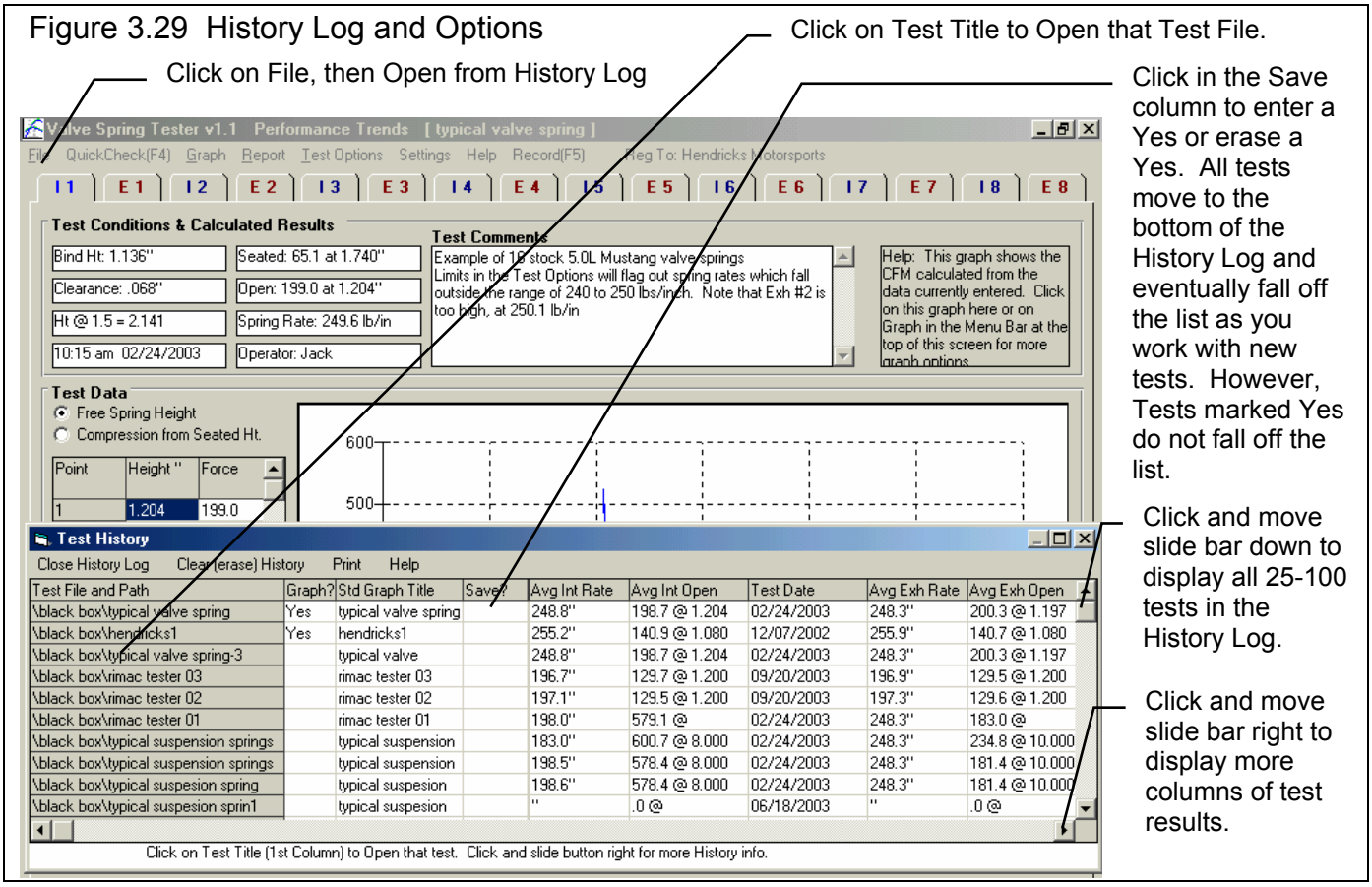
Print List of All Files Fitting These Conditions will search through the entire Test Library (all folders in the SpringData folder) for files matching these conditions and display them in a new screen. From this screen, you can also print the list. This is the quickest way to see which folders may contain test files matching your conditions.

> Tip: When looking for a word, the program doesn’t care if it is in CAPITAL (upper case) or small (lower case) letters. In Figure 3.37 above you are looking for the word BowTie in the test comments. The program will display all files which have the word “BowTie” or the word “BOWTIE” or the word “bowtie” or the word “BowTIE” anywhere in the comments. The program will ***not*** find files with the words “Bow Tie” (with a space between Bow and Tie) . Therefore, it may be smarter to just look for the word “bow” to avoid this problem. Note, however, that if you do this, the program will also find tests with the word “elbow” or “crossbow” , for example, in the test comments.

# 3.8 History Log

Click on File, then Open form History Log at the Main Screen to obtain the History Log shown below in Figure 3.29. This screen shows a summary of the results for the last 25-100 tests you have worked with (started new, opened, graphed, etc.) The number of tests in the log (25-100) is selectable in the 'Preferences' menu at the Main Screen. When you work with a new test, it is added to the top of the History Log, and (if the Log is full) the last run drops off the bottom of the list. In the Pro Version, the History Log is an alternate way to open tests which have been saved to the Test Library. The advantage of the History Log is it lists the tests you most recently worked with at the top.

Figure 3.29 History Log and Options




| Test File and Path | Graph? | Std Graph Title | Save? | Avg Int Rate | Avg Int Open | Test Date | Avg Exh Rate | Avg Exh Open |
|---|---|---|---|---|---|---|---|---|
| \black box\typical valve spring | Yes | typical valve spring | | 248.8" | 198.7 @ 1.204 | 02/24/2003 | 248.3" | 200.3 @ 1.197 |
| \black box\hendricks1 | Yes | hendricks1 | | 255.2" | 140.9 @ 1.080 | 12/07/2002 | 255.9" | 140.7 @ 1.080 |
| \black box\typical valve spring-3 | | typical valve | | 248.8" | 198.7 @ 1.204 | 02/24/2003 | 248.3" | 200.3 @ 1.197 |
| \black box\rimac tester 03 | | rimac tester 03 | | 196.7" | 129.7 @ 1.200 | 09/20/2003 | 196.9" | 129.5 @ 1.200 |
| \black box\rimac tester 02 | | rimac tester 02 | | 197.1" | 129.5 @ 1.200 | 09/20/2003 | 197.3" | 129.6 @ 1.200 |
| \black box\rimac tester 01 | | rimac tester 01 | | 198.0" | 579.1 @ | 02/24/2003 | 248.3" | 183.0 @ |
| \black box\typical suspension springs | | typical suspension | | 183.0" | 600.7 @ 8.000 | 02/24/2003 | 248.3" | 234.8 @ 10.000 |
| \black box\typical suspension springs | | typical suspension | | 198.5" | 578.4 @ 8.000 | 02/24/2003 | 248.3" | 181.4 @ 10.000 |
| \black box\typical suspesion spring | | typical suspesion | | 198.6" | 578.4 @ 8.000 | 02/24/2003 | 248.3" | 181.4 @ 10.000 |
| \black box\typical suspesion sprin1 | | typical suspesion | | " | .0 @ | 06/18/2003 | " | .0 @ |

From this screen you can open a test file by clicking on the 'Test File and Path' column (first column on the left). If the test file was saved to a standard folder (directory, or whatever you have chosen to call folders in the Preferences menu), the folder name is given first, followed by the test file name.

If a test file has been Opened from or Saved to a non-standard folder (a folder not in the SpringData folder) using the 'Advanced' function, the entire path is given. If the 'Path and File Name' won't fit, it is shortened and preceded by '...'.

You can choose to Save certain results you believe are special and you may want to recall or graph in the future by clicking on the Save column to insert a Yes there. Tests marked Yes to Save eventually move to the bottom of the History Log, but are never dropped off the list or erased until you again click on the Yes to make it blank.

> ***Note that just the Test File Name stays in the History Log. Should you delete the file using the Open (from all saved tests) command, the test file will be deleted. When you try to open it or graph if from the History Log, you will get note saying the file can not be found.***

You can print the History Log on a printer by clicking on the 'Print' menu command. Note that the History Log will be most readable when the Page Orientation is in Landscape setting.

## History Log at Graph Screen

At the Graph Screen, several options are available to graph selected tests from the History Log, and change the Graph Titles. You can obtain the History Log by clicking on the menu command History Log at the top of the Graph Screen. The History Log is how you graph different tests together for comparison. From this screen you can:

- Choose to Graph certain Test Results by clicking on the Graph column to insert a Yes there. Tests marked Yes to Graph will be graphed when you click on the 'Graph Tests Marked 'Yes' '. The first test (usually the current Flow Test you are working with) is always graphed even with no Yes marked. The number of tests actually graphed is limited by available space, usually a limit of about 48 graph lines total.
- Graph only the current test results (the test file at the top of the Log) by clicking on 'Graph Current Test Only'.
- Click on 'Graph Title' to change the Standard Title for this test. The program defaults to putting in the Head # unless it is blank, when it then puts in the test file name. (You can also specify 'Alternate' titles and legend names by clicking on 'Format' at the top of the Graph Screen, then 'Edit Titles/Legends'.)
- Choose to Save certain results you believe are special and you may want to recall or graph in the future. See the Save explanation of the previous page

# Appendix 1 Accuracy and Repeatability

## Accuracy

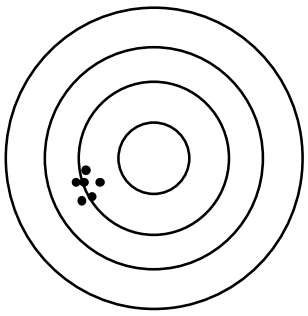
The difference between ***repeatability*** and ***accuracy*** is a concept few people understand. Graphically, accuracy and repeatability is shown in Figure A.1. Think of the spring tester as an "archer" which is trying to hit the "bull's eye" or the true spring measurements. Let's say the true Spring Rate was 245.5 lbs/inch, but one flow bench always comes up with values between 230 to 231 lbs/inch. This tester is not very accurate, but is very repeatable (only a 1 lb/inch spread in data). Another tester comes up with measurements which vary from 241 to 250 lb/inch, which average out to the true 245.5 lb/inch. This tester with the 9 lb/inch spread in data is not nearly as repeatable as the first, but is more accurate.

Ideally, you want both a repeatable and accurate spring tester, but this is not always possible. When are accurate measurements and repeatable measurements most desirable?

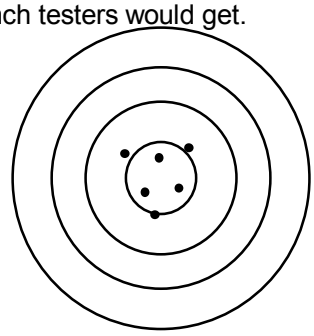
- If you very accurately want to determine if a spring is different than another spring, or has changed from when it was first installed in the engine, the repeatable tester is the one to use.
- If you want spring specs to prove to a cam grinder that these springs will work with their cam grind, for other people to compare their springs with, you are better off with the accurate tester.
- If you must prove the springs you are selling are within your customer's specs, you need the accurate tester.
- If you want springs specs to use in an engine simulation computer program, you are better off with the accurate tester.

**Figure A1**

**Repeatable Measurements**
produce the same readings, test after test, but the reading may not be the true CFM.



**Accurate Measurements**
produce a reading which is close to the ***true*** reading, which is a reading other accurate flow bench testers would get.

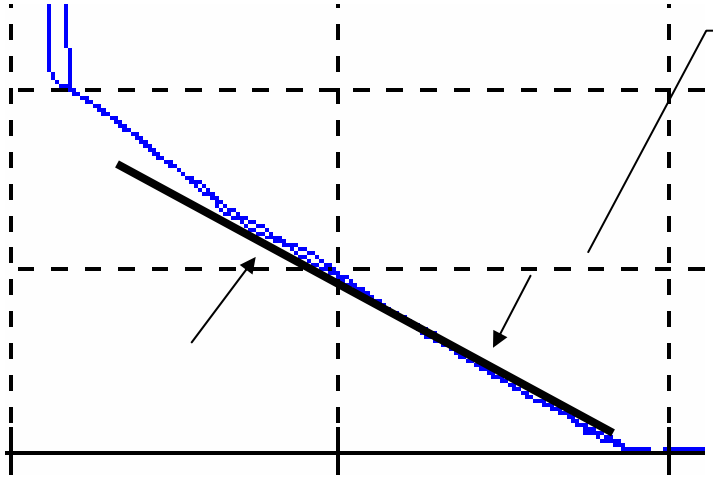


The accuracy of your tester will depend much on how you calibrate it and how well it holds calibration. See Section 2.4. The length measurement calibration is fairly easy to keep accurate as blocks of a specific height (thickness) are easy to obtain or make. The force measurement is more difficult. It is best to hang a known weight as shown in Section 2.4, Figure 2.21, but calibrating with a known spring is much easier. If you need to certify that your spring tester is calibrated correctly, then hanging a known weight is the only way to calibrate.

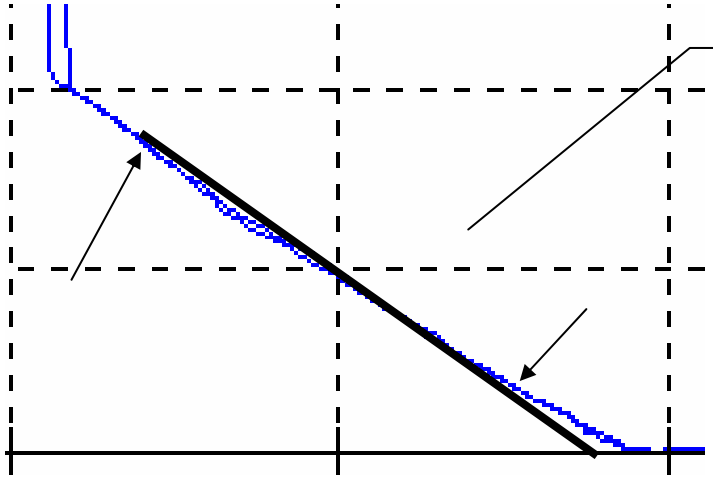
## Repeatability

Performance Trends has developed sophisticated math to analyze the raw data recorded from the spring tester to make it the most repeatable tester available. This is done by knowing that the spring's force must ***always*** increase as it gets compressed. This analysis makes it possible for you to obtain spring forces at various heights repeatable to within 0.1 lbs. Spring Rates can be repeatable to within 0.5 lbs. See Figure A 2 which shows that using the Raw Data and/or using just specific points from the Raw Data can produce very non-repeatable results. The statistical analysis of the Valve Spring Tester can take this data and obtain true spring rates which can repeat within 1 lb or better.

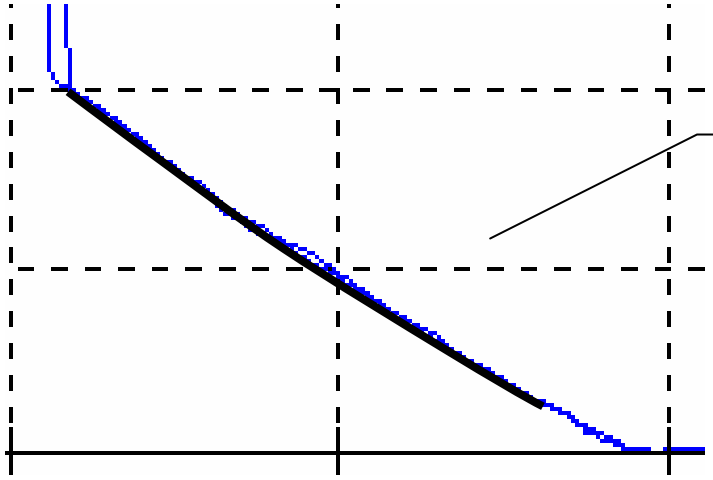
Figure A 1 Determining Spring Rate from Raw Data



Case 1 Spring Rate is determined by calculating the difference in spring force between 2 different spring heights, generally the Seated and Open Heights. Picking these 2 points at the arrows to determine the spring rate (slope of this line) comes out with a lower slope (lower spring rate) than shown in the 2nd case below



Case 2 Picking the Open and Seated Heights at the arrows to determine the spring rate (slope of this line) comes out with a much higher slope (higher spring rate) than shown in the 2nd case below



Case 3 By using all points recorded, the statistical analysis gives nearly the same slope (spring rate) no matter which 2 points are used for Open and Seated Heights.

# Appendix 2 Backing Up Data

Backing up data means to make more than one copy of the data which can be used or referred to at a later date. This may be needed in the event one copy becomes lost or erased, or you need room in the Flow Test Library. Backing up data can take 2 basic forms:

Paper Reports
Copying files with Windows copy commands

Other than making Paper Reports, backing up data requires knowledge of Windows Explorer commands. Unless you are experienced with Windows commands, have someone experienced with Windows assist you to prevent losing data.

## Paper Reports:

If you already keep written copies of all spring tests you perform, you already understand this form of backing up data. When you finish a test, print out the various types of reports for this test. Simply store this paper report in a safe place.

Disadvantage of Paper Back Ups:

For example, say you have accidentally erased a spring test file but have a paper report of that data. From these paper reports, there is no way to do a comparison graph to other spring test, or recalculate the Seated Force from a new Seated Spring Height, etc. What you printed out is all these test results will ever be.

## Copying data to disk with Windows commands:

Obviously copying the data to disks is the preferred method of backing up because you can do all sorts of analysis or modifications from computer data that is just not possible from paper back ups. If you are not familiar with Windows commands, have someone help you the first couple of times. However, ***this is the most reliable and most efficient way to back up your data.***

Note: Unless stated otherwise, all mouse clicks are with the normal, left button on the mouse.

To copy Entire SpringData Folder using Windows Explorer, which contains all folders and test files in the Test Library:

Click on Start, then Programs, then Windows Explorer (usually at the bottom of the list of programs). You will obtain the Windows Explorer screen shown in Figure A5.

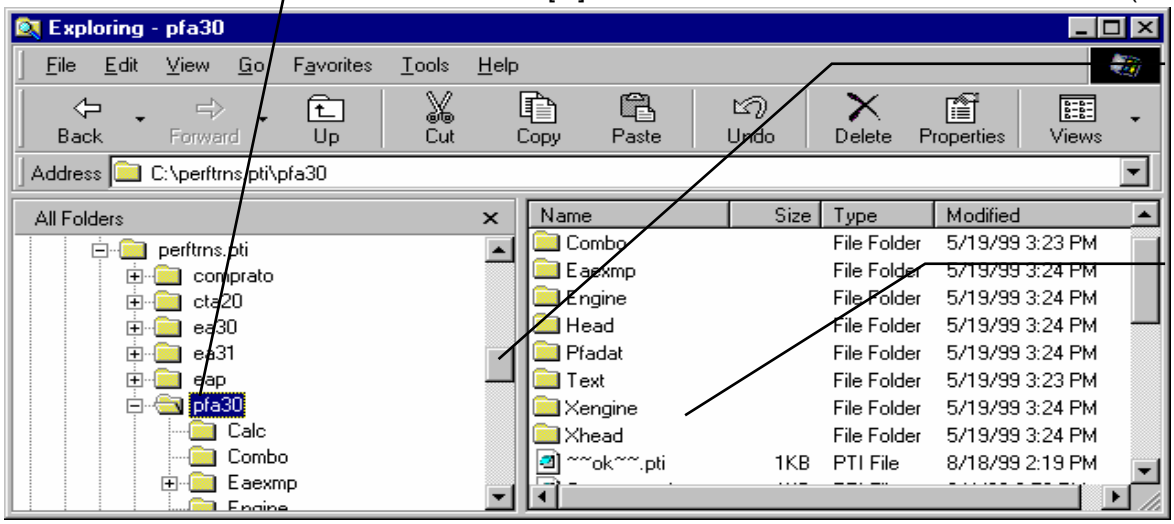
Locate the PERFTRNS.PTI folder (may not be printed in capital letters) on the left side of the Windows Explorer screen, usually on the C drive. Click on the [+] sign to the left of it to display the contents of the PERFTRNS.PTI folder.

You should now see the Spring-V folder. Click on the [+] sign to the left of it to display the contents of the Spring-V folder.

You should now see the SpringData folder. Right click on the yellow SpringData folder icon to display the menu of options. Click on the Copy command to copy this entire folder (all test files in the standard Test File Library).

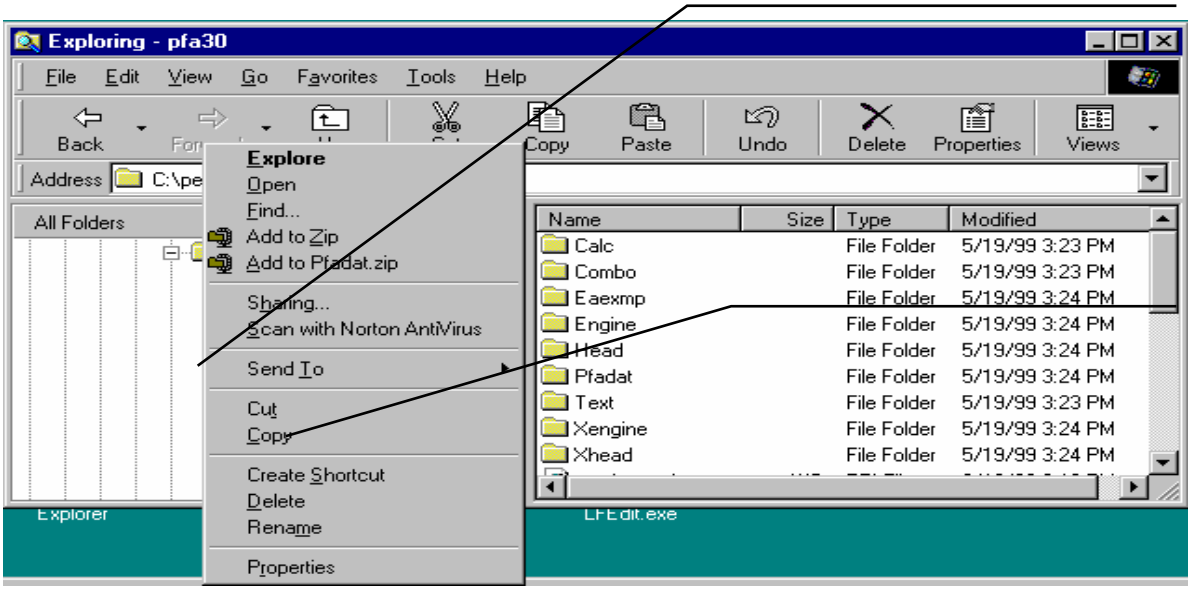
## Figure A5 Copying Files with Windows 95, 98 or NT Windows Explorer

Find the PFA30 folder under the PERFTRNS.PTI folder, usually on the C drive. Click on the [ +] box to the left of a folder to show its contents (folders).



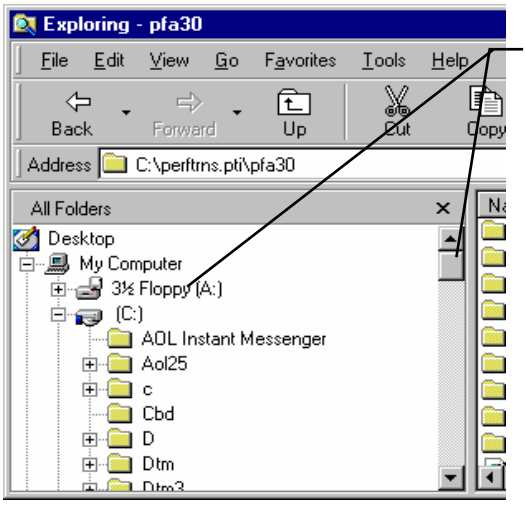

Click and drag the slide bar button to move up and down the list of folders.

The contents of the open (clicked on) folder on the left is shown here, including both folders and files.

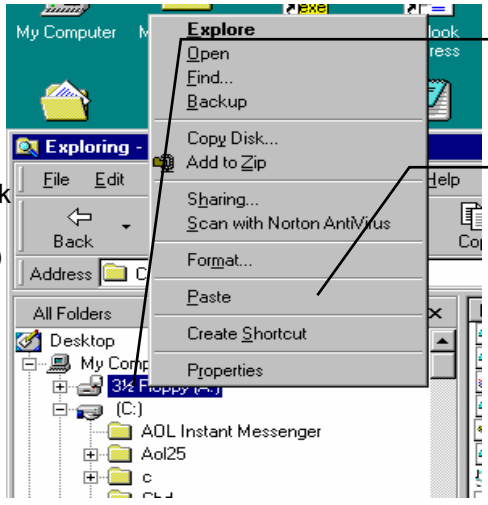



***Right*** click (with the right mouse button) on the PFADAT folder (not seen here) to open a menu of options.

Click on Copy to copy the entire contents of the PFADAT folder (the entire test file library). DO NOT click on Cut.




Drag slide bar to the top of the list to find your Floppy disk drive (usually A)




Right click on the Floppy drive icon.

Then click on Paste to paste whatever you copied (in this example, the entire PFADAT folder) to the disk in the Floppy drive.

Now you must tell the computer where you want to copy the files to. Click and drag the slide bar for the left section of the Windows Explorer screen to the top. (You can also click on the up or down arrow buttons on the slide bar.) Look for the Floppy Drive icon, usually the "A" drive. Put a new, formatted disk in the floppy drive. Then right click on the Floppy Drive icon, and select Paste from the list of options. You will see the floppy drive light come on as the entire SpringData folder and all its contents are copied to the floppy disk. Label this disk with something like "SpringData folder, xx/xx/xx" with a name and date.

Notes:

If you have so many tests in the Test Library, they may not all fit onto 1 floppy disk. Windows Explorer will tell you this and ask you to insert another new, formatted disk. If this happens, be sure to label all disks with a name, date and sequential #s, and keep the entire disk set together. A suggestion for novice computer users is to make each folder under SpringData a separate floppy disk. This may require more floppy disks, but will make it easier to understand restoring just certain folders in the future.

You may just want to back up one particular folder in the test library (in the SpringData folder) or just 1 particular test. You would do this the same as with copying the entire SpringData folder, just click on the [+] by the SpringData folder to display the folders under SpringData. Then right click on the folder you want to Copy. To find individual test files, click on the yellow folder icon containing the test file and the contents of the folder will be shown on the right side of the Windows Explorer screen. Then right click on the test file name and select Copy.

You can also copy individual test files to the floppy drive inside the Valve Spring Tester Analyzer program. Open the file you want to copy so it is the current test file. Then click on File at the top of the Main Screen, then select Copy to Floppy Disk.

More experienced computer users may want to use the "Backup" features built into Windows 95 and 98 (click on Start, Programs, Accessories, System Tools, Backup). This compresses test files so it takes fewer floppy disks. However you need to use the Backup program to restore test files, which can be more confusing to novice computer users.

## Restoring Data

**Be very careful when restoring data, as you may overwrite Test Files with old, erroneous information. Read all the information below before restoring data. If you are not familiar with Windows Explorer, have someone more experienced help you.**

**The ONLY reason to restore data is if you have lost test files. This could be because you mistakenly erased it, you had a major computer failure, or you are moving the program to another computer. Do NOT restore data unless you have one of these problems, as you could possible create many more problems than you are trying to fix.**

When restoring test files and folders, you pretty much reverse the procedure for backing up. First you put your backed up floppy disk in the floppy drive. Then open Windows Explorer, find the Floppy drive icon and click on it to display its contents. Right click on the folder you want to restore and select Copy.

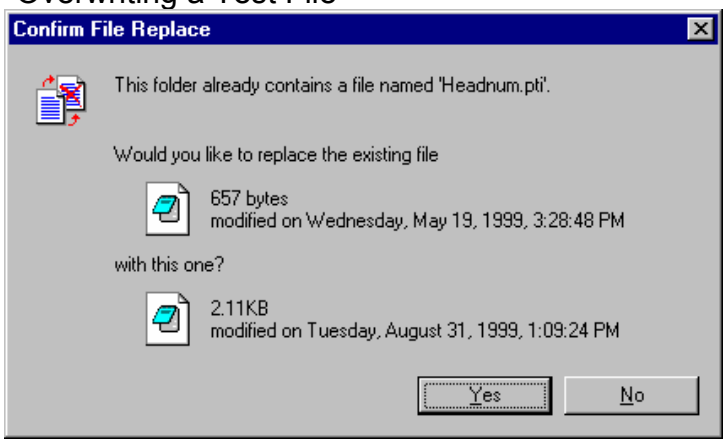
Now find the SpringData folder under Spring-V under PERFTRNS.PTI, usually on the C: drive. Right click on the folder ***1 level up*** from the folder you are restoring. For example, if you are restoring the test file folder CHEV which was in the SpringData folder, you must click on the SpringData folder. If you are restoring the entire Test Library folder SpringData, you must click on the Spring-V folder. If you are restoring the test file 194-150 which was in the CHEV folder under the SpringData folder, you must click on the CHEV folder.

During the restoring (copying) process, Windows Explorer checks to see if it is overwriting an existing file (Figure A6). If it is, it will ask you if the existing file or folder should be overwritten. Be very careful when overwriting files, as you may overwrite a new test file with data from an old test file of the same name.

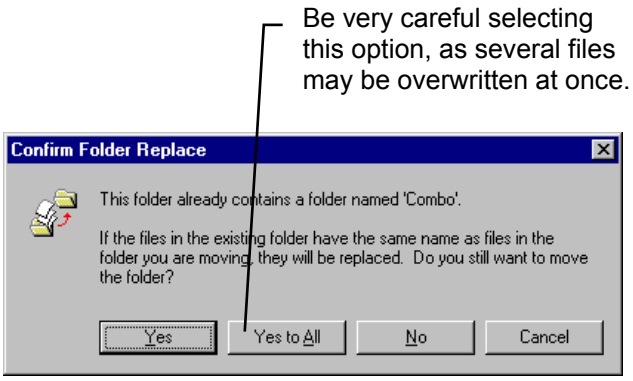
**Before restoring test files, it is good practice to back up all test files first. Then if you make a mistake, and overwrite test files you didn't mean to, you have your backup copies to restore the test files from.**

Figure A6 Windows Explorer Warnings when Overwriting Test Files

Overwriting a Test File




Overwriting an Entire Folder (several files)




**IMPORTANT: Check Appendix 3 v1.1B Features for the latest enhancements to this software.**

# Appendix 3 V1.1B Features

The v1.1B of the Valve Spring Tester adds several new features, which are described in this Appendix. In addition, the Automatic Spring Tester was released after the original publication of this manual, so some of its features will be described here also.

## Calculation and Accuracy Improvements:

A new Shim report has been added, which lets you specify different shim requirements and the program automatically finds the best shims for each spring to meet those requirements. See Figure A9.

A Valve Lift input has been added to the Quick Check screen so you can quickly find a seated height which meets your seated force requirements and quickly shows bind height clearance. See Figure A10.

A new, faster "Gen 3" USB logger has been released, which records more data and provides for better accuracy. You need this v1.1B to read that logger.

Figure A7 New, Faster Mini Logger (looks same from outside as previous logger)

## Operation:

Graph printouts now have no border around the graph, so there are no broken lines on the left side of the printed graph. See Figure A11.

Program has added Graph Format option to display the Legend Titles to appear in 3 different font sizes, larger than the standard font. See Figure A12.

Program now allows up to 100 data points for graphs and/or reports.

Program now automatically checks for proper USB logger, and warns you if you have chosen the wrong one.

Program now disables the 'Settings' option on main screen until you have opened a previous test as a template.

There is a new Preference to allow for showing when calibration numbers do not match those of the master tester specs. This could cause confusion to some users. The Preference also lets you set this toy 'Always', which is very handy for troubleshooting.

Company Logo is now displayed on Main Screen.

Program has added Export to Excel option to screen for saving ASCII data files. See Figure A14.

Program has added a Browse button screen for saving ASCII data files. See Figure A14.

Program has several improvements so it is more accurate when calibrating force from a known spring. It also has more explanation about calibrating with a known spring and further identify if you must include a retainer for doing the calibration.

When switching program or file from Metric to English units or vice versa, the program now also converts the Quick Check settings and Spring Height scales in the Electronics screen.

Program has a New Preference of “Warn About Slowing Data Recording” which you can set to 'No' to stop the "nag" screen we added.

Program now warns you if tester encounters a force which is close to over-ranging and damaging the load cell. This can be due to too force from user, or testing springs which are too large for the range of load cell. The program may be able to still use the data for a valid test, but just warn you.

Starting with Windows Vista, the Operating System works best if the data files for programs are stored in a “public” folder, and not with the program files under C:\Program Files or C:\Program Files(x86) folder. For some brands of computers, this is not a big problem, for other brands, and or newer operating systems like Windows 8 or newer, this can be a big problem. Therefore, starting with this v1.1 B, we are storing the data files for Vista, Windows 7, Windows 8, Windows 10 in the folder path of:

C:\Users\Public\Public Documents\Performance-Trends-Data\Valve-Spring-Tester-Files

Therefore, if you want to copy data files using Windows Explorer, or other types of browsers, start looking in this location. See Figure A15.

## Automatic Valve Spring Tester:

The Automatic Spring Tester uses an air cylinder to stroke the valve spring into bind, then allowing the spring to return to is fully open height, and then retract back to it’s fully retracted position. All these different steps may need to be “tweeked” depending on the air pressure supply, length and/or force of the valve springs, or your particular spring tester. Some of the items listed below identify different settings in the program to tweek these steps. See Figure A13.

Notes:

Since the Automatic Spring Tester is powered by compressed air, the amount of force the tester can generate depends on the air pressure. The standard tester with a 4 inch cylinder can generate about 12 lbs of force for each PSI of air pressure, or about 1500+ lbs at 130 psi shop air pressure. The optional High Pressure tester with a 5 inch cylinder can generate about 19.5 lbs for each PSI of air pressure, or about 2500+ lbs at 130 psi shop air pressure. A clean, steady supply of high pressure shop air will help the Automatic Tester operate reliably and accurately.

You must choose one of the “Automatic tester” or the “Gen III” logger types under Settings, then Tester Calibration to see all of these features in the program.

Figure A8 Automatic Spring Tester


There is an Option in the Electronics Recording Screen, under "Automatic Tester Utilities" called Maximum Compression Time, the amount of time before the tester assumes there is not enough force for bind, and stops compressing. Click on Options, then Automatic Tester, then Maximum Compression Time to change this. The default of 15 seconds is typical a good setting.

There is an Option in the Electronics Recording Screen, under "Automatic Tester Utilities" called "Retract Setpoint". The default is 10 units, but can be adjusted by the user. If you find the tester is not retracting once the spring is fully open, try increasing this number.

There is an Option in the Electronics Recording Screen, under "Automatic Tester Utilities" called Number of Pre-Test Cycles. Many engine builders believe you get a more accurate, repeatable number if you run the valve spring into bind a few times before you

make your final measurement. These Pre-Test Cycles are sometimes called “bull nosing”. Zero 0 is the default setting.

There is an Option in the Electronics Recording Screen, under "Automatic Tester Utilities" called Safety Setting – Minimum Clearance. This is the amount of clearance allowed between the 2 plattens. This should be set low enough to be less than your spring’s bind height, but not so low as fingers could be crushed.

In Preferences, there are also some Automatic Spring Tester settings to note:

Click on Settings, then Preferences, then General Operation tab at the top. The Preference of “Auto Tester, Pause after Bind” is the amount of time the tester will set at bind before retracting. If the tester seems to be “hanging up” at the bind condition, try changing this setting. Zero (0) is the default setting.

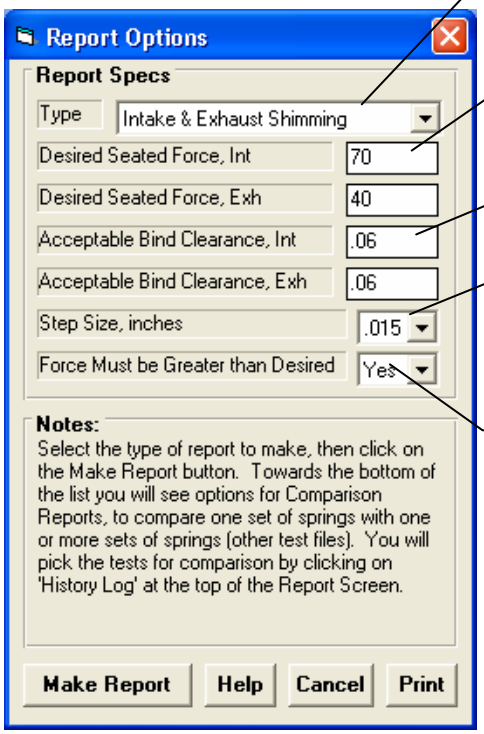
Click on Settings, then Preferences, then General Operation tab at the top. Set the Preference of “Auto Tester has High Force Option” to Yes, if you have the High Force tester with 5” diameter air cylinder. This adjusts the cycle parameters some, and accurately shows the approximate air pressure be supplied to the tester. No is the default setting.

The approximate air pressure being supplied to the Auto Tester is now displayed on the recording screen. This can help you troubleshoot problems if the spring is not being compressed sufficiently or quickly.

An info message has been added for if the spring tester exceeds the 'Auto Tester Max Compression Time' and possible reason being 'Digital Retract Offset'.

The Auto Spring Tester now stops it's test cycle when it encounters a force which is close to over-ranging and damaging the load cell. This can be due to too much air pressure, or testing springs which are too large for the range of load cell. The program may be able to still use the data for a valid test, but just warn you.

Figure A9 Shim Report




Start by choosing the Shimming Report, and then these shim options become visible.

Set how much Seated Force you require.

Set how much Bind Clearance you require.

Because shims typically come in different increments, choose the increment (step) size for the shims you hav available.

Choose No and the program finds the shim giving the force closest to your desired seated force, which could be less than the desired force. Choose Yes and the program finds the shim giving the force closest and greater than your desired seated force.

These settings from Test Options screen determine the valve lift required for the cam you are using.

Your desired Seated Forces show here.

Valve Spring Tester 'Plus' v1.1B [ Typical Valve Spring ]

Back Print Report Types File History Log Help

Comments

Test Time 10:15 am 02/24/2003 | Int: 1.204 1.740 .100 >70.0 | Exh: 1.197 1.740 .100 >40.0 | Report of: Intake_Exhaust Std Report | Operator: Jack | Errors: None

| Cylinder | Spring Rate | Open Force | Open Height | Seated Force | Seated Height | Non Linear % | Bind Ht | Clearance | Shim | Possible Valve Lift |
|---|---|---|---|---|---|---|---|---|---|---|
| Int 1 | 285.0 | 228.4 | 1.204 | 75.6 | 1.740 | 12.4 | .936 | .028 < .06 | .240 | .504 |
| Exh 1 | 236.6 | 171.4 | 1.197 | 43.0 | 1.740 | 2.4 | .937 | .155 | .105 | .638 |
| Int 2 | 281.3 | 226.0 | 1.204 | 75.2 | 1.740 | 10.8 | .936 | .028 < .06 | .240 | .504 |
| Exh 2 | 238.7 | 173.2 | 1.197 | 43.6 | 1.740 | 3.3 | .936 | .156 | .105 | .639 |
| Int 3 | 284.8 | 228.3 | 1.204 | 75.6 | 1.740 | 11.7 | .936 | .028 < .06 | .240 | .504 |
| Exh 3 | | | | | | | .937 | .155 | .105 | .638 |
| Int 4 | | | | | | | .935 | .029 < .06 | .240 | .505 |
| Exh 4 | | | | | | | .933 | .159 | .105 | .642 |
| Int 5 | | | | | | | .942 | .037 < .06 | .225 | .513 |
| Exh 5 | | | | | | | .935 | .157 | .105 | .640 |
| Int 6 | | | | | | | .933 | .046 < .06 | .225 | .522 |
| Exh 6 | | | | | 1.740 | 2.9 | .937 | .155 | .105 | .638 |
| Int 7 | | | | | 1.740 | 7.3 | .935 | .044 < .06 | .225 | .520 |
| Exh 7 | 240.1 | 174.6 | 1.197 | 44.2 | 1.740 | 3.0 | .938 | .154 | .105 | .637 |
| Int 8 | 257.4 | 210.1 | 1.204 | 72.1 | 1.740 | 5.8 | .936 | .043 < .06 | .225 | .519 |
| Exh 8 | 239.6 | 173.8 | 1.197 | 43.7 | 1.740 | 2.3 | .937 | .155 | .105 | .638 |
| Int. Maximum | 286.5 | 230.1 | 1.204 | 76.6 | 1.740 | 12.4 | .942 | .046 | .240 | .522 |
| Int. Minimum | 257.4 | 210.1 | 1.204 | 72.1 | 1.740 | 5.8 | .933 | .028 | .225 | .504 |
| Int. Spread | 29.1 | 20.0 | .000 | 4.5 | .000 | 6.6 | | | | |
| Int. Average | 274.6 | 221.5 | 1.204 | 74.3 | 1.740 | 9.9 | | | | |
| Exh. Maximum | 241.2 | 174.6 | 1.197 | 44.2 | 1.740 | 3.3 | | | | |
| Exh. Minimum | 236.6 | 171.4 | 1.197 | 43.0 | 1.740 | 2.3 | | | | |
| Exh. Spread | 4.6 | 3.2 | .000 | 1.2 | .000 | 1.0 | | | | |
| Exh. Average | 238.9 | 173.4 | 1.197 | 43.7 | 1.740 | 2.8 | | | | |

Shim required to meet your Seated Force requirement.

This shows how much valve lift is possible to meet your requirements of Seated Force and Bind Clearance.

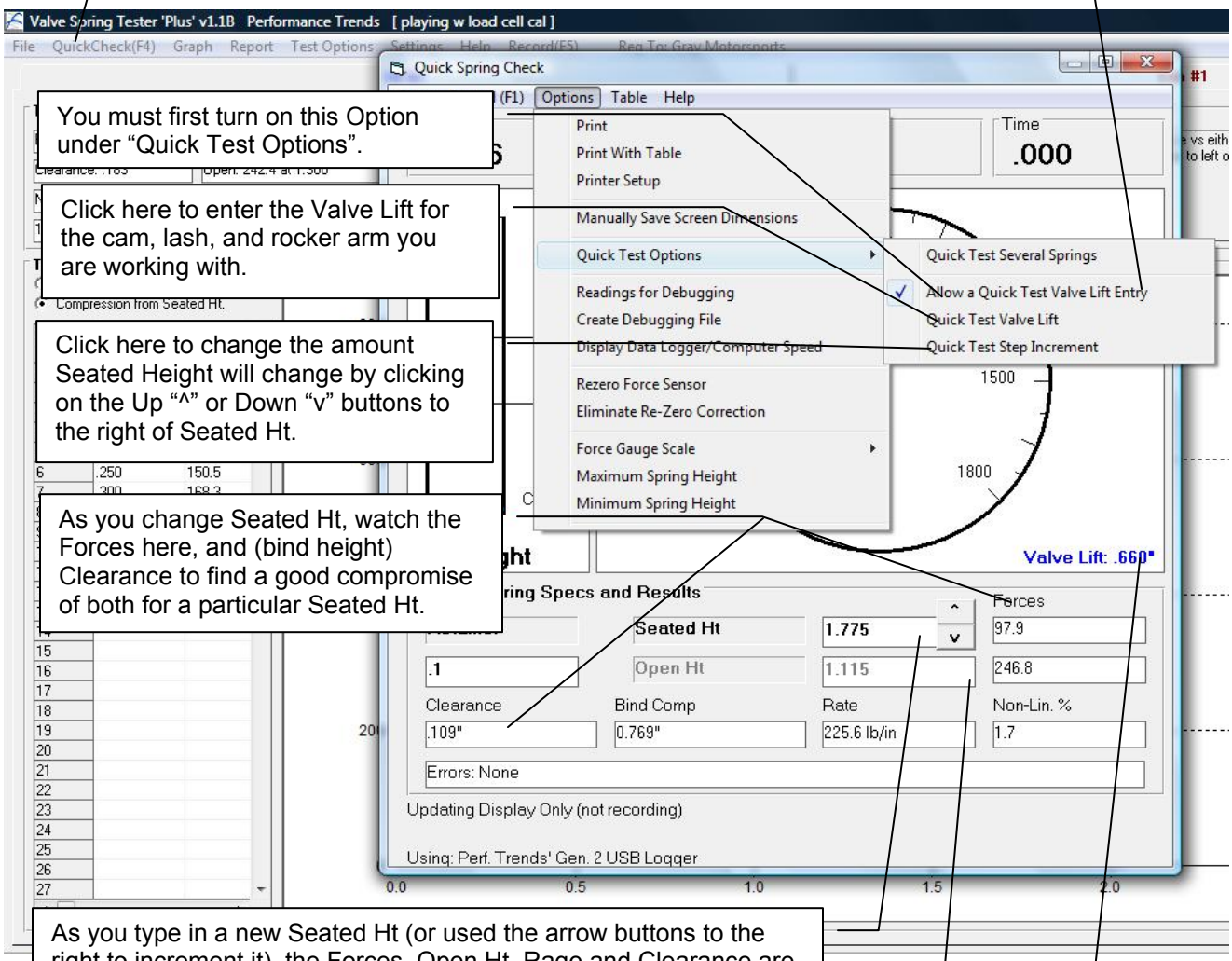
Flag for Clearance spec not being met.

Note that Int and Exh minimum Seated Forces are greater than your Desired Force, as selected for “Force Must be Greater than Desired” in screen above.

Figure A10 Valve Lift on Quick Check Screen

This feature is only available for “Quick Check” screen, by clicking here or pressing F4.

This “Valve Lift” feature is designed to let you quickly find a Seated Height which works well with a particular cam (Valve Lift) you are working with, producing enough Seated Force but still allowing for enough Bind Height Clearance.




You must first turn on this Option under “Quick Test Options”.

Click here to enter the Valve Lift for the cam, lash, and rocker arm you are working with.

Click here to change the amount Seated Height will change by clicking on the Up “^” or Down “v” buttons to the right of Seated Ht.

As you change Seated Ht, watch the Forces here, and (bind height) Clearance to find a good compromise of both for a particular Seated Ht.

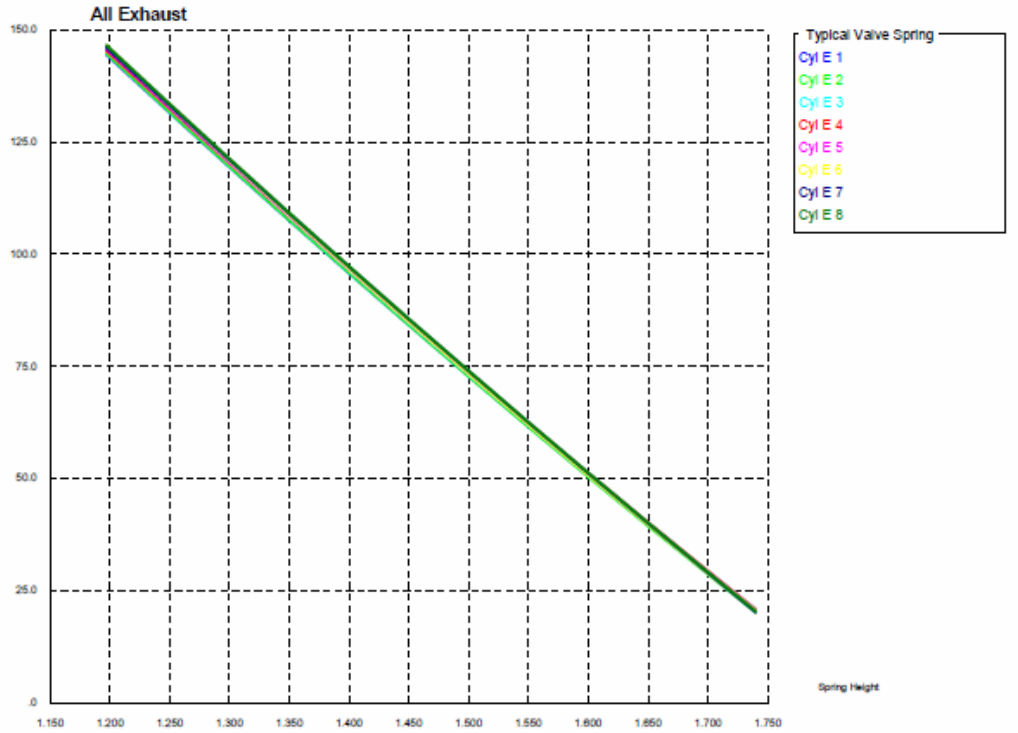
As you type in a new Seated Ht (or used the arrow buttons to the right to increment it), the Forces, Open Ht, Rage and Clearance are all updated. This lets you quickly find the Seated Ht which works for the particular requirements for the cam and valve train you are working with.

Open Ht is disabled because it is calculated from the Seated Ht entered above it and the Valve Lift you have entered.

The Valve Lift you enter under Options is shown here. You can also click on this reading and enter Valve Lift directly without going through Options.

Figure A11 New Graph Printout

Valve Spring Tester 'Plus' v1.1B GRAY MOTORSPORTS This Graph Printed:
Test: Typical Valve Spring 704-809-1070 9:05 am 11-01-15
Folder: examples Performance Trends (C) 2013 Page: 1




Graph Comments would go here, if you select to do so.

Test Summary and Comments for: Typical Valve Spring

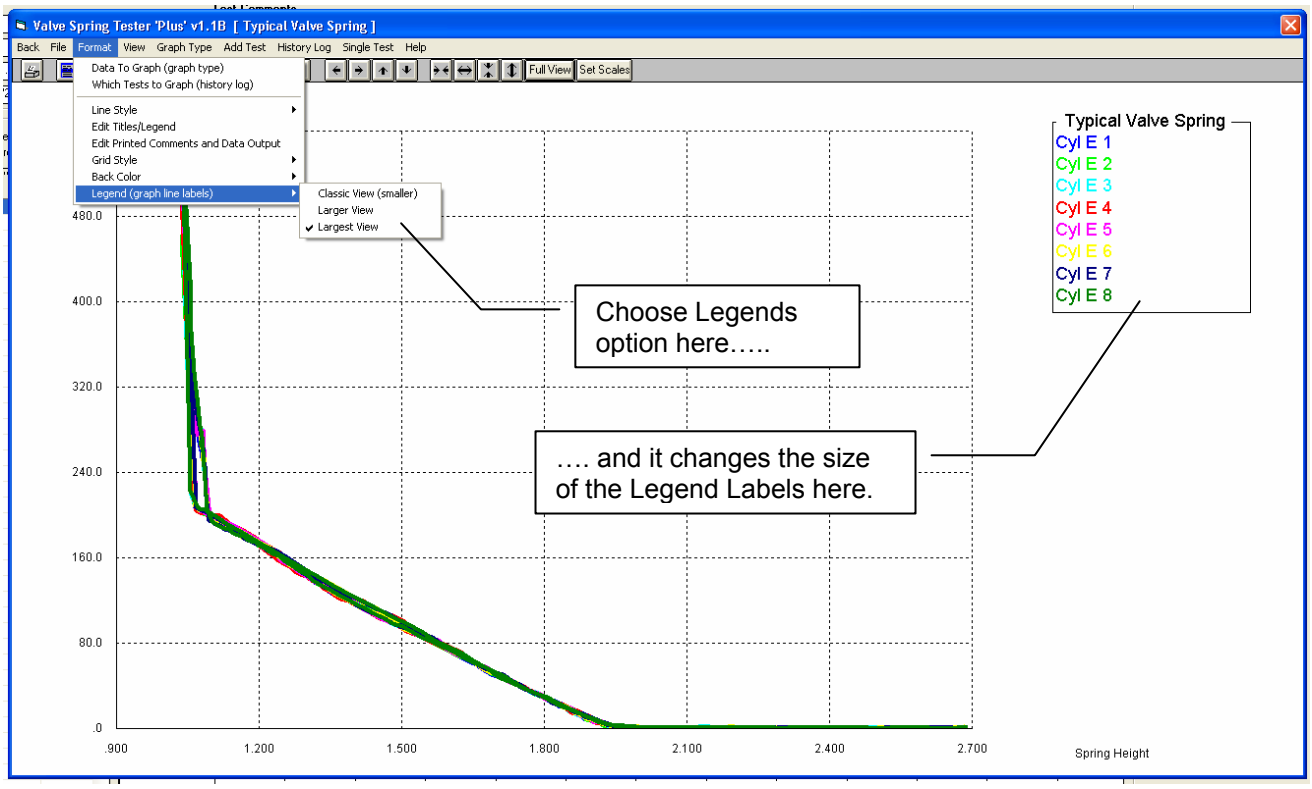
| Test Time | | Open Ht | Seated Ht | Retainer | Ht for: | Graph of: | All 8 Cylinders |
|---|---|---|---|---|---|---|---|
| 10:15 am | Int: | 1.204 | 1.740 | .100 | 100. lb | Operator: | Jack |
| 02/24/2003 | Exh: | 1.197 | 1.740 | .100 | 150. lb | Errors: | None |

Example of 16 stock 5.0L Mustang valve springs
Limits in the Test Options will flag out spring rates which fall outside the range of 240 to 250 lbs/inch. Note that Exh #2 is too high, at 250.1 lb/in

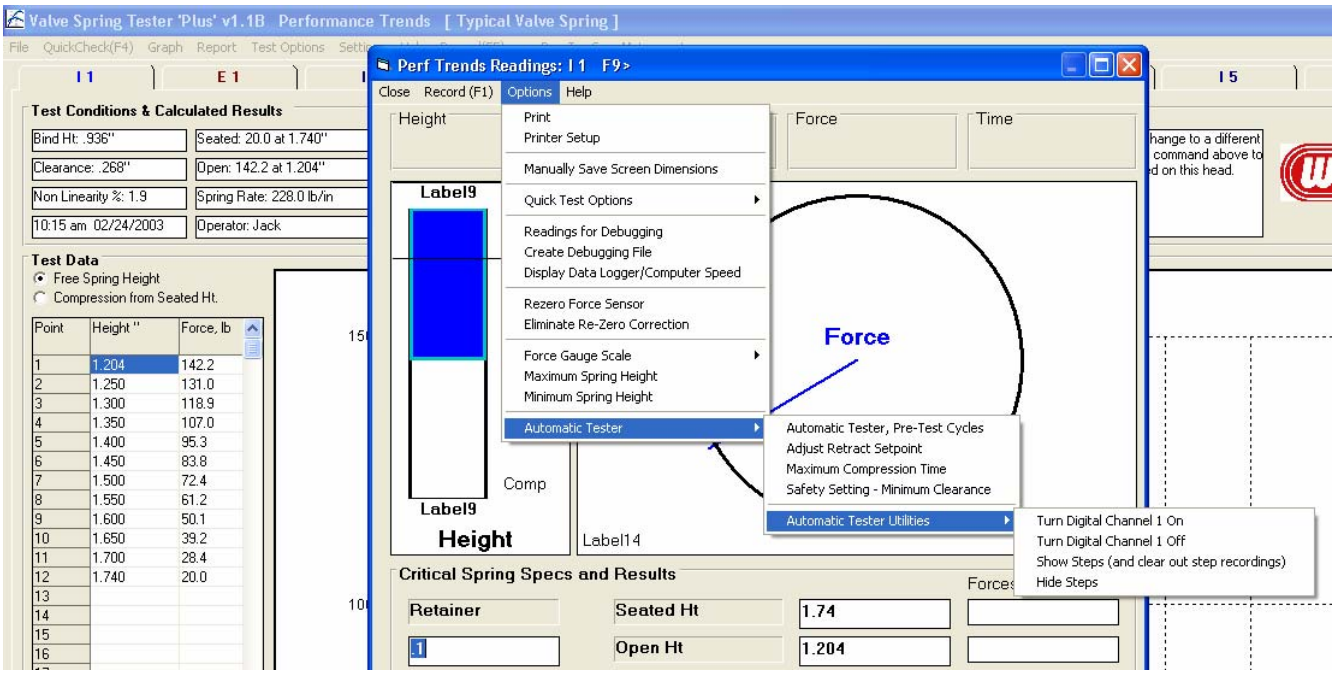
| Lift | 1.197 | 1.200 | 1.250 | 1.300 | 1.350 | 1.400 | 1.450 | 1.500 | 1.550 | 1.600 | 1.650 | 1.700 | 1.740 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cyl E 1 | 144.5 | 143.7 | 131.5 | 119.4 | 107.5 | 95.8 | 84.2 | 72.8 | 61.5 | 50.5 | 39.6 | 28.8 | 20.4 |
| Cyl E 2 | 144.7 | 144.0 | 131.7 | 119.6 | 107.6 | 95.8 | 84.2 | 72.8 | 61.5 | 50.4 | 39.4 | 28.6 | 20.1 |
| Cyl E 3 | 145.6 | 144.9 | 132.5 | 120.3 | 108.3 | 96.5 | 84.8 | 73.4 | 62.1 | 50.9 | 40.0 | 29.2 | 20.7 |
| Cyl E 4 | 145.3 | 144.6 | 132.4 | 120.3 | 108.4 | 96.6 | 85.0 | 73.5 | 62.2 | 51.1 | 40.1 | 29.3 | 20.7 |
| Cyl E 5 | 145.8 | 145.1 | 132.7 | 120.5 | 108.5 | 96.6 | 84.9 | 73.4 | 62.1 | 50.9 | 39.9 | 29.1 | 20.6 |
| Cyl E 6 | 146.4 | 145.6 | 133.1 | 120.8 | 108.7 | 96.7 | 85.0 | 73.4 | 62.0 | 50.8 | 39.8 | 28.9 | 20.4 |
| Cyl E 7 | 146.0 | 145.2 | 133.0 | 120.9 | 108.9 | 97.1 | 85.4 | 73.8 | 62.4 | 51.1 | 39.9 | 28.9 | 20.2 |
| Cyl E 8 | 146.6 | 145.8 | 133.4 | 121.2 | 109.2 | 97.3 | 85.5 | 73.9 | 62.5 | 51.2 | 40.1 | 29.1 | 20.4 |

New graph style eliminates the lines to the left and right of the graph. These lines could appear broken on some styles of printers.

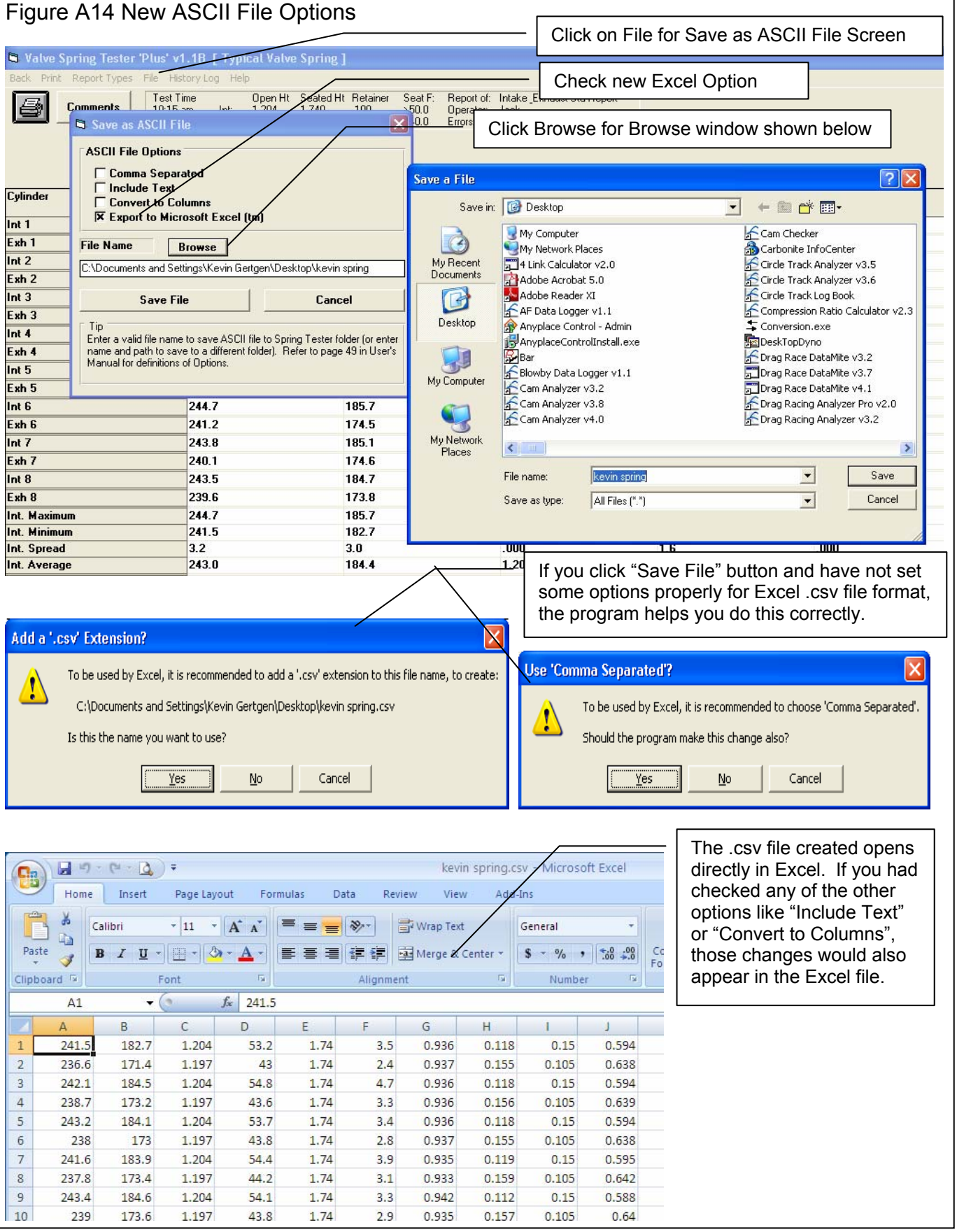
## Figure A12 New Graph Feature, Larger Legends




## Figure A13 Automatic Spring Tester Options



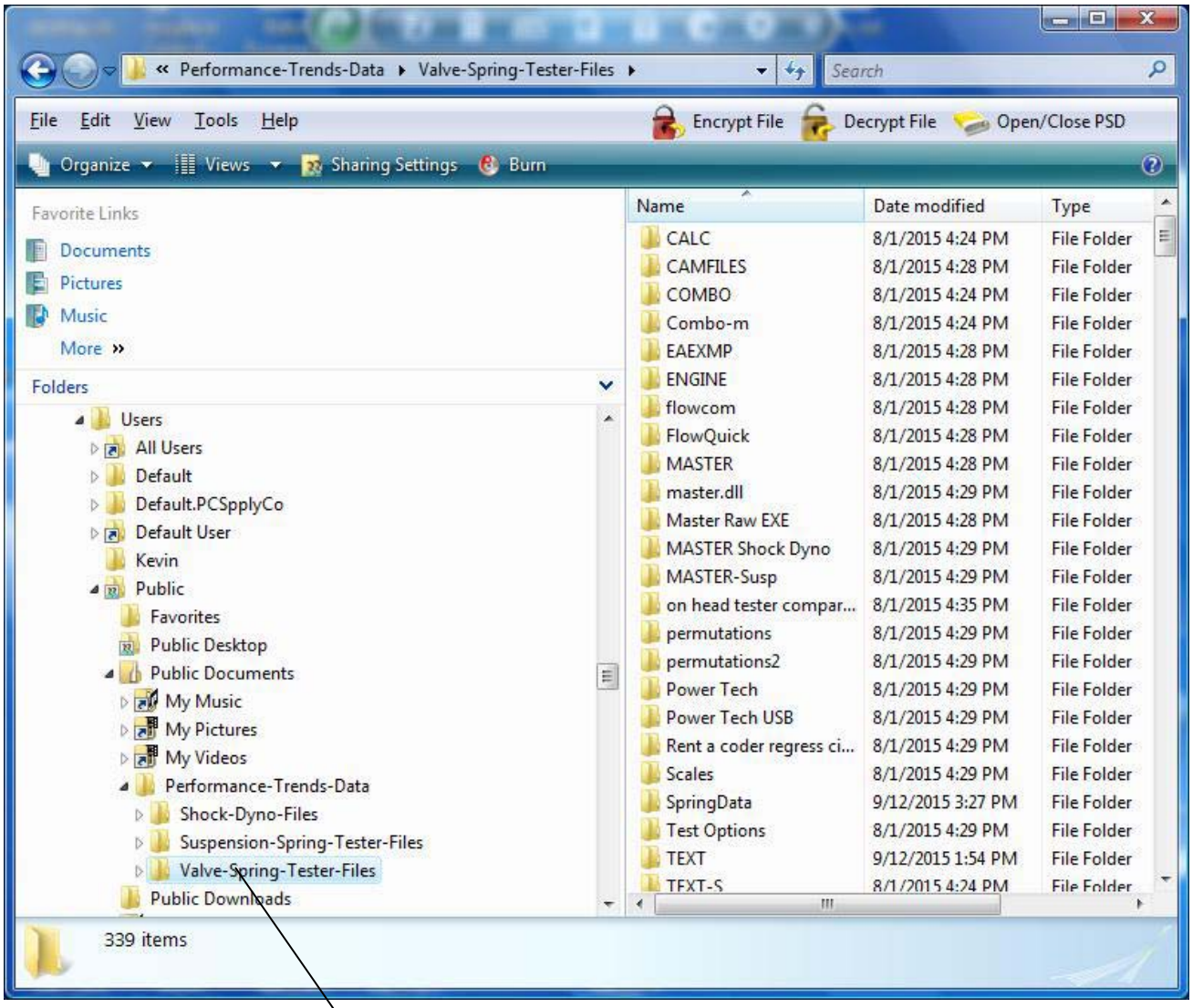
## Figure A14 New ASCII File Options




| Cylinder | | |
|---|---|---|
| Int 1 | | |
| Exh 1 | | |
| Int 2 | | |
| Exh 2 | | |
| Int 3 | | |
| Exh 3 | | |
| Int 4 | | |
| Exh 4 | | |
| Int 5 | | |
| Exh 5 | | |
| Int 6 | 244.7 | 185.7 |
| Exh 6 | 241.2 | 174.5 |
| Int 7 | 243.8 | 185.1 |
| Exh 7 | 240.1 | 174.6 |
| Int 8 | 243.5 | 184.7 |
| Exh 8 | 239.6 | 173.8 |
| Int. Maximum | 244.7 | 185.7 |
| Int. Minimum | 241.5 | 182.7 |
| Int. Spread | 3.2 | 3.0 |
| Int. Average | 243.0 | 184.4 |

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 241.5 | 182.7 | 1.204 | 53.2 | 1.74 | 3.5 | 0.936 | 0.118 | 0.15 | 0.594 |
| 2 | 236.6 | 171.4 | 1.197 | 43 | 1.74 | 2.4 | 0.937 | 0.155 | 0.105 | 0.638 |
| 3 | 242.1 | 184.5 | 1.204 | 54.8 | 1.74 | 4.7 | 0.936 | 0.118 | 0.15 | 0.594 |
| 4 | 238.7 | 173.2 | 1.197 | 43.6 | 1.74 | 3.3 | 0.936 | 0.156 | 0.105 | 0.639 |
| 5 | 243.2 | 184.1 | 1.204 | 53.7 | 1.74 | 3.4 | 0.936 | 0.118 | 0.15 | 0.594 |
| 6 | 238 | 173 | 1.197 | 43.8 | 1.74 | 2.8 | 0.937 | 0.155 | 0.105 | 0.638 |
| 7 | 241.6 | 183.9 | 1.204 | 54.4 | 1.74 | 3.9 | 0.935 | 0.119 | 0.15 | 0.595 |
| 8 | 237.8 | 173.4 | 1.197 | 44.2 | 1.74 | 3.1 | 0.933 | 0.159 | 0.105 | 0.642 |
| 9 | 243.4 | 184.6 | 1.204 | 54.1 | 1.74 | 3.3 | 0.942 | 0.112 | 0.15 | 0.588 |
| 10 | 239 | 173.6 | 1.197 | 43.8 | 1.74 | 2.9 | 0.935 | 0.157 | 0.105 | 0.64 |

Figure A15 New Location for Spring Tester Data Files (not for XP or older)



# Index